5452, May 30, 1920 and *Hymenophysa pubescens* C. A. Meyer, no. 5254, May 30, 1920, both along the M. C. railway at Ypsilanti. These last two were first found by Prof. B. A. Walpole. On June 8th, 1932, Mr. Gladewitz and I found along roadsides and banks of streams at Bell Branch in Wayne Co., Mich., a plant that comes nearest to *L. densiflorum* Schrad. var. *Bourgeauanum* (Thell.) C. L. Hitchc., according to Prof. C. L. Hitchcock. The variety occurs in the Rocky Mountain region to Alaska.—O. A. Farwell, Lake Linden, Mich.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXVIII

I. NOTES ON SILPHIUM

Lily M. Perry

The genus *Silphium* ranging from the mid-Atlantic and southern States to the western prairie-region is most diverse in the South. Here the species are more numerous and, owing to the high variability of the characters, specific lines are rather difficult to determine. In an endeavor to order up the herbarium material, Gray's treatment of the genus, Syn. Fl. N. A. i.[2] 240–242, 449 (1886), has been most helpful. Small's revisions, Fl. Se. U. S. 1240–1245 (1903) and Man. 1408–1415 (1933), have also been useful in evaluating the more recent literature.

I am indebted to Dr. H. A. Gleason of the New York Botanical Garden, Dr. W. R. Maxon of the United States National Herbarium and Dr. H. K. Svenson of the Brooklyn Botanic Garden for the privilege of examining various types and other specimens in their herbaria.

As in all genera of the *Compositae*, the heads afford the best determinative features, yet these are not too definite. The achenes are rather inconstant owing to the somewhat fickle development of the wing-apices; truncate achenes, with teeth lacking and wing-margins scarcely 0.5 mm. wide, were found in three species and in others a similar tendency was observed. Immature achenes have practically no diagnostic value in critical determinations, yet good mature ones are lacking in too many specimens. Pubescence of the chaff-tips is helpful in separating groups and in combination with other characters it may be useful in delimiting species. The ray-flowers of herbarium material are often immature or poorly pressed. Involucral bracts are

fairly reliable as to shape and, with few exceptions, their pubescence or the lack of it is significant. Leaf-arrangement may be opposite, alternate and verticillate in the same species; since this is true of more than one species, it is an unsafe and misleading, though often used, key-character. One collector notes "This stalk with some fifteen others grew from one and the same root. Seven of the stalks bore opposite leaves and nine bore three and four leaves in a whorl. That is—the seven—S. integrifolium—and the nine S. trifoliatum were one and (the same)." As a matter of fact all were *S. integrifolium*. Likewise, pubescence, a mixture of varying degrees of coarse and fine trichomes, is somewhat inconstant in quantity on stems, peduncles and leaves.

Since single characters vary widely, character-combinations have been used wherever possible as a means of determining species. In the following key it should be noted that, even when the plant as a whole is glabrous, *leaves, bracts of the involucres and chaff-tips are usually*, at least in some slight degree, *ciliate*.

a. Leaves or their petiolar bases connate-perfoliate.
  Stem glabrous: involucral bracts glabrous.....1. *S. perfoliatum.*
  Stem hirsute with widely spreading or retrorse hairs: involucral bracts pubescent.....2. *S. connatum.*
a. Leaves not connate-perfoliate....*b.*
  b. Involucral bracts foliaceous, if becoming somewhat coriaceous in age, not long-acuminate: leaves entire or variously toothed or lobed, if pinnate or bipinnatifid restricted to the basal and lower part of the stem....*c.*
    c. Involucral bracts not at all coriaceous, more or less spreading and usually squarrose at the tips: leaves distributed up the stem....*d.*
      d. Achenes with relatively broad wing (usually 2 or more mm. wide at base of sinus tapering to a margin of 1 mm. or more) and deep sinus (2–4 mm.)....*e.*
        e. Heads usually several, corymbose: leaves of firm texture, usually opposite or alternate but at times verticillate, lance- to broad-ovate, the upper sessile by a rounded or subcordate base....*f.*
          f. Bracts loosely spreading with reflexed tips, the inner broadly ovate.
            Stem, peduncles and exposed surface of involucral bracts rough-hispid.....3. *S. asperrimum.*
            Stem and peduncles glabrous and glaucous: involucral bracts glabrous on both surfaces..4. *S. speciosum.*
          f. Bracts slightly spreading with reflexed tips (heads appearing more compact than in the above named species), the inner oblong-ovate to elongate-oblong.
            Involucral bracts scabrous-pubescent (at least on the upper exposed tips) to almost glabrous: the inner ovate to oblong-ovate and acute or obtusish: wing-tips of achenes deltoid and acute or obtusish.

Involucral bracts pubescent but not glandular.....5. *S. integrifolium.*
Involucral bracts glandular-pubescent.....Var. *Deamii.*
Involucral bracts glabrous on both surfaces; the inner elongate-oblong and obtusish or rounded: wing-tips of achenes lance-acuminate.....Var. *Gattingeri.*

e. Heads few (2–5) and irregularly arranged: leaves membranous, opposite or alternate, ovate-oblong to oblong- or elongate-lanceolate....*g.*
g. Stem slender and wand-like: upper leaves few and abruptly smaller than the radical.....6. *S. gracile.*
g. Stem stouter and rigid: leaves gradually reduced in size upward.
Involucre coarsely hirsute, ciliate with trichomes about 2 mm. long.....7. *S. Reverchoni.*
Involucre somewhat scabrous or puberulent, ciliate with trichomes about 1 mm. long.
Petiolar bases of leaves scabrous-hispidulous; trichomes with markedly bulbous bases: involucral bracts ovate tending toward obovate: chaff-tips sparsely glandular-pubescent.....8. *S. Simpsonii.*
Petiolar bases of leaves hispid-hirsute: trichomes with only slightly bulbous bases: involucral bracts lanceolate to ovate: chaff-tips pubescent, not glandular.....Var. *Wrightii.*

d. Achenes with narrow wing (usually 1.5–2 mm. (rarely more) wide at base of sinus quickly tapering to a margin of 1 mm. or less) and comparatively shallow sinus (0.2 mm., rarely more)....*h.*
h. Peduncles and ovate-lanceolate involucral bracts hirsute-hispidulous.
Bracts of the involucre appressed with somewhat acuminate and usually squarrose tips: chafftips minutely glandular-pubescent.
Achenes with shallow sinus and narrow wing..9. *S. Gatesii.*
Achenes truncate and practically wingless..Forma *truncatum.*
Bracts of the involucre loosely erect with acute spreading-erect tips: chaff-tips hispidulous, not glandular.....10. *S. Mohrii.*
h. Peduncles and involucral bracts glabrous or finely pubescent....*i.*
i. Chaff-tips minutely pubescent, not glandular: outer bracts of the involucre with spreading to reflexed tips....*j.*
j. Peduncles and involucral bracts glabrous....*k.*
k. Leaves gradually reduced up the stem: achenes usually with a definite sinus....*l.*
l. Leaves hastate- or deltoid-lanceolate, long-petioled on main stem (sessile on branches): achenes suborbicular, slightly broader at apex, emarginate or with shallow sinus.....11. *S. brachiatum.*
l. Leaves lanceolate or ovate-lanceolate, all but the uppermost petioled or with petiolar base: achenes obovate or elliptic with wing-tips acute or obtusish....*m.*

m. Petioles hirsute: achenes elliptic, 9–9.5 mm. long excluding wing (11 mm. with wing).....12. *S. atropurpureum.*

m. Petioles short-ciliate or hispidulous: achenes obovate-elliptic, 6–9 mm. (av. 7 mm.) long excluding wing (8–10 mm. with wing).

Plant with at least the upper surface of the leaves pubescent: leaves chiefly verticillate though often opposite or alternate.

Achene with sinus; wing at least 0.5 mm. wide.....13. *S. trifoliatum.*

Achene truncate; wing less than 0.5 mm. wide.....Forma *praecisum.*

Plant glabrous: leaves opposite (at least in all specimens seen).....Var. *latifolium.*

k. Leaves chiefly basal, the upper greatly reduced: achenes with very shallow sinus and minute teeth.....14. *S. confertifolium.*

j. Peduncles and involucral bracts finely pubescent. 15. *S. Asteriscus.*

i. Chaff-tips minutely glandular-pubescent: involucral bracts glabrous, the outer usually with strongly reflexed tips: leaves opposite or alternate.

Stem, at least the lower part, glabrous: leaves ovate: peduncles glabrous or occasionally scabrous: achenes with rounded wing-tips or truncate.

Sinus of achenes 1–2.5 mm. deep, up to 3 mm. broad.....16. *S. dentatum.*

Achenes truncate.....Forma *nodum.*

Stem pubescent: leaves narrowly lanceolate: achenes with wing-tips at times slightly constricted at base of sinus.....Var. *angustatum.*

c. Involucral bracts becoming somewhat coriaceous in age, spreading erect, rounded at the apices: leaves basal or confined to the lower part of the stem; cauline, if present, mostly very greatly reduced....*o.*

o. Involucre 2.5–4 cm. broad; bracts in about three series, the outer only slightly shorter than the second and about half the length of the inner.

Petiole longer than the blade.

Leaves cordate, dentate.....17. *S. terebinthinaceum.*

Leaves pinnatifid or lobed.....Var. *pinnatifidum.*

Petiole shorter than the blade: leaf-blades tapering at base.....18. *S. rumicifolium.*

o. Involucre 1–2.5 cm. broad: bracts in three or four series, the inner gradually longer than the outer....*p.*

p. Leaves usually with petiole longer than the blade: achenes cuneate-obovate to obovate, 5–6.5 (–8.5) mm. long.

Leaf-blades longer than broad, variously cut or lobed or pinnatifid.

Involucres 1–2 cm. broad: leaves cut or lobed, sparsely pubescent (rarely rough pubescent) to glabrous.....19. *S. compositum.*

Involucres 1–1.5 cm. broad: leaves pinnatifid or pinnate with pinnae variously cut, glabrous....Forma *orae.*

Leaf-blades usually broader than long, merely dentate.....Var. *reniforme.*

p. Leaves with petiole shorter than or equaling the blade: achenes orbicular or suborbicular, 6–10 mm. long.

Involucre 1.5–2 cm. broad; achenes 6–8 mm. long; wing-tips somewhat triangular, at base of sinus about 2.5 mm. broad: smaller veins of leaves obvious.....20. *S. venosum.*

Involucre 2–2.5 cm. broad: achenes 8–10 mm. long; wing-tips rounded, at base of sinus 3.5–4 mm. broad: smaller veins of leaves inconspicuous. 21. *S. ovatifolium.*

b. Involucral bracts thick, becoming coriaceous in age, long-acuminate: leaves deeply pinnatifid or bipinnatifid.

Rays white: achenes oblong-oval with deep sinus (3–5 mm.) and awns tending to project beyond the wing-tips: stem 3–9 dm. high.....22. *S. albiflorum.*

Rays yellow: achenes obovate-oval with shallow sinus (2–3 mm.) and awns mostly short and inconspicuous: stems 18–24 dm. high.

Involucral bracts and peduncles hispid or scabrous, not glandular.....23. *S. laciniatum.*

Involucral bracts and peduncles hispidulous to pubescent and glandular.....Var. *Robinsonii.*

1. S. PERFOLIATUM L. Syst. ed. 10: 1232 (1759), Sp. Pl. ed. 2: ii. 1301 (1763); Gouan, Hort. Monsp. 462 (1762). *Resinocaulon perfoliatum* Lunell in Amer. Midl. Nat. v. 62 (1917). For further synonymy see Gray, Syn. Fl. i^2. 240 (1884), excluding *S. connatum* L. and *S. scabrum* Moench. Mass., Conn., Pa., Ohio, Ind., Ky., Tenn., Miss., Ill., Minn., Iowa, Mo., S. D., Neb., Kans. and Okla.

This species is so readily recognized that it seems unnecessary to cite specimens.

2. S. CONNATUM L. Mant. ii. 574 (1771); Willd. Sp. Pl. iii^3. 2332 (1804). W. Va., Va., and N. C. WEST VIRGINIA: rocky soil, Ganley Bridge, June 19, 1903, *Biltmore Herb.*, no. 4589c (US).[1] VIRGINIA: alluvial woods, along New River, near the Narrows, Giles County, *Griscom & Hunnewell*, no. 18731. NORTH CAROLINA: without data, *Schweinitz* (NY) and on the same sheet another specimen with no further data than Aug. 19, 1818, marked *S. connatum*.

Although this *Silphium* has been regarded as a mere variation of *S. perfoliatum* with hirsute stems and pubescent involucres, it is here retained as a species on account of the difference in the foliar character. In the original description Linnaeus points out that the leaves are sessile, not petiolate as in *S. perfoliatum*. Mr. Francis W. Hunnewell, who collected this species in Virginia, most kindly verified this leaf-

[1] Specimens cited are at the Gray Herbarium unless otherwise designated (NY, New York Botanical Garden; US, U. S. National Herbarium; B, Brooklyn Botanic Garden).

character and volunteered the information that the petiolate leaves are basal. Unfortunately, mature heads are too scarce for much dissection. The above citations represent all the material of this rare species in the three herbaria named.

3. S. ASPERRIMUM Hook. Comp. Bot. Mag. i. 99 (1835). *S. radula* Nutt. in Trans. Amer. Phil. Soc. vii. 341 (1840). Mo., Okla. and Texas. MISSOURI: Campbell, *B. F. Bush*, no. 6395. OKLAHOMA: Fonts, Lincoln County, August 26, 1895, *J. W. Blankinship*. TEXAS: without data, *Drummond*, no. 193, *Lindheimer*, no. 257 of Fasc. II; prairies, Dallas, *E. Hall*, no. 322; slopes and margins of creeks under thickets, New Braunfels, July, 1851, *Lindheimer*, no. 610; Sequin, *B. H. A. Groth*, no. 188; southwestern Texas, September, 1879 to October, 1880, *E. Palmer*, no. 599; western Texas, *Reverchon*, no. 89. Probably Texas (labeled N. Mex., 1852), *C. Wright*, no. 1408.

A plant fairly easy to recognize by its chiefly alternate leaves, coarse pubescence, large heads and broad-winged achenes. The following specimens are somewhat atypical, tending to have smooth stems and scabrous peduncles—OKLAHOMA: Clinton, *E. J. Palmer*, no. 12578. TEXAS: Dallas, June, 1875, *J. Reverchon;* Tarrant County, *A. Ruth*, no. 389.

4. S. SPECIOSUM Nutt. in Trans. Amer. Phil. Soc. vii. 341 (1840). *S. integrifolium*, β. *laeve* T. &. G. Fl. N. Am. ii. 279 (1842). *S. integrifolium*, var. *mesochorum* Benke in Rhodora, xxxiv. 10 (1932). Mo., Ark.?, Neb., Kans. and Okla. Plains of Arkansas, *Nuttall* (probably part of the TYPE-collection). MISSOURI: common along railroad, Sheffield, *Bush*, no. 1743; rocky woods, Southwest City, *Bush*, no. 10175. NEBRASKA: Verdigris River, *F. Clements*, no. 2724; Lincoln, August 4, 1898, *J. M. Bates* (in part); Red Cloud, July 27, 1903, *Bates*. KANSAS: prairie, Riley County, *J. B. Norton*, no. 251; banks of South Fork of Solomon River, within 5 miles of Osborne City, *C. L. Shear*, no. 179; Claflin, *H. C. Benke*, no. 5176 (TYPE-collection of *S. integrifolium*, var. *mesochorum*). OKLAHOMA: near Ponca, *G. W. Stevens*, no. 1916; Cherokee Nation, August 18, 1895, *J. W. Blankinship*.

This species is easily distinguished from *S. integrifolium* by its glabrous and glaucous stem and peduncles as well as by its larger and somewhat looser heads with more broadly ovate inner involucral bracts. Moreover, *S. speciosum* is a plant of the western prairie rather than of the central region of the United States. Possibly it intergrades with *S. asperrimum* causing the atypical specimens mentioned under that species.

5. S. INTEGRIFOLIUM Michx. Fl. Bor.-Am. ii. 146 (1803). *S. integrifolium*, var. *ternatum* Wood, Class Bk. ed. 2:336 (1847). Ind., Tenn.,

Miss., Ill., Mo. and Kans. INDIANA: sandy soils along the roadside, 2½ miles south of Purcell, *C. C. Deam*, no. 54304; sandy bank, Lake Cicotte, *R. C. Friesner*, no. 6419 (NY). MISSISSIPPI: prairies, Paenola County, August 18, 1898, *H. Eggert* (NY). ILLINOIS: without data, *Buckley;* near Olney, *R. Ridgway*, no. 787; Athens, August, 1863, *E. Hall* (B); prairies near Oquawka, *H. N. Patterson* (NY). MISSOURI: dry hills of prairie, St. Louis, *H. Eggert*, July 27, 1875, *Eggert* (B). KANSAS: Atchison County, August, 1866, *G. Scarborough* (B).

Var. **Deamii**, var. nov., var. *typicae* simillima differt involucris glanduloso-pubescentibus. Ind., Ala., Miss., Wisc., Ill., Ia., Mo. and Ark. INDIANA: right of way of railroad, ½ mile east of Dana, *Deam*, no. 54369; 1 mile east of Dana, *Deam*, no. 54376 (TYPE in Gray Herb.); along roadside, 1½ miles north of Tal, *Deam*, no. 21579; open sandy woods, East Chicago, *O. E. Lansing, Jr.*, no. 2577. ALABAMA: dry roadside thickets near Marion, September 1, 1885, *J. D. Smith.* MISSISSIPPI: Taylorville, *S. M. Tracy*, no. 8527. WISCONSIN: Milwaukee, *Lapham;* Madison, *N. C. Fassett*, no. 14970; prairies, Racine County, September, 1883, *H. E. Hasse* (NY). ILLINOIS: Fountaindale, *M. S. Bebb;* Stony Island, *H. H. Smith*, no. 6016; meadow on State St., near 81st St., Chicago, *J. M. Greenman*, no. 1969; thickets, Chicago, July 20, 1895, *W. S. Moffatt;* Champaign, August 2, 1899, *H. A. Gleason;* Bloomington, September 3, 1904, *B. L. Robinson;* Normal, August, 1886, *B. L. Robinson;* Peoria, August, 1904, *F. E. McDonald.* IOWA: Fayette, July, 1894, *B. Fink;* Deer Creek, Guthrie County, September 11, 1867, *J. A. Allen;* Keosauqua, *Pammel & Reese*, no. 1266 in part. MISSOURI: Martin City, *K. K. Mackenzie*, no. 38 (NY). ARKANSAS: Little Rock, *H. E. Hasse* (NY).

A somewhat wider geographic range and the glandulosity of the involucres are the only marked differences between var. *Deamii* (named for Mr. C. C. Deam who first called attention to the glandular pubescence of the involucres) and typical *S. integrifolium.* Mr. Weatherby very kindly examined the Michaux type at Paris in 1935 and found the involucres not glandular.

Var. **Gattingeri**, var. nov., involucri squamis ciliatis cetera glabris, interioribus elongato-oblongis obtusis exterioribus lanceolatis vel oblongo-lanceolatis; achaeniis apice lanceolato-acuminatis. TENNESSEE: Charlotte Pike, Nashville, July, 1886, *Gattinger* (TYPE in Gray Herb.).

This variety is distinguished from the typical by the glabrous involucres, the elongate-oblong and obtusish inner involucral bracts and the obovate-elliptic achenes with lance-acuminate wing-tips. Although in some specimens of typical *S. integrifolium* from Missouri the involucral bracts are almost glabrous (usually scabrous on the

upper exposed surface) the inner involucral bracts are ovate and the wing-tips of the achenes are broader; however, owing to the great variability of the character of the wing-tips and the fact that Deam's no. 54369 has very long narrow wing-tips it seems best to keep this distinctive specimen as a variety.

6. S. GRACILE Gray in Proc. Amer. Acad. viii. 653 (1873). LOUISIANA: prairies, Vinton, April 15, 1911, *R. S. Cocks* (NY); prairies, Fee, vicinity of Lake Charles, *K. K. Mackenzie*, no. 465 (NY).
TEXAS: Laporte, *Reverchon*, no. 3989; Cypress City, near Houston, *Reverchon*, no. 748; III, without data, *Drummond*, no. 193.

No other species with broad-winged achenes has so greatly reduced and remote cauline leaves.

7. S. REVERCHONI Bush in Rep. Mo. Bot. Gard. xvii. 125 (1906). TEXAS: Lindale, June, 1903, *Reverchon*.

The obvious characters of *S. Reverchoni* are the shaggy pubescence and the hirsute-hispid and long-ciliate involucral bracts. The heads are as large as some of those of *S. asperrimum*, but the former is readily distinguished from the latter by the narrowly lanceolate upper leaves as well as by the pubescence.

8. S. SIMPSONII Greene, Pittonia, iv. 44 (1899). FLORIDA: in damp ground in pine barrens, Palma Sola, July 8, 1890, *J. H. Simpson* (TYPE in U. S. Nat. Herb.); Bradentown, *S. M. Tracy*, no. 7473; hammocks, Myers, *A. S. Hitchcock*, no. 166.

The large nearly orbicular and very broadly winged achenes are a distinctive feature of this species.

Var. **Wrightii**, var. nov., petiolis et basi foliorum hispido-hirsutis; involucri squamis lanceolatis vel ovatis. LOUISIANA: without data, *Hale*. TEXAS: without data, 1848, *C. Wright* (TYPE in Gray Herb.); Kingsbury, Guadalupe County, *E. J. Palmer*, no. 11649.

Var. *Wrightii* differs from the typical in the longer pubescence of the petioles and petiolar bases, the more distinctly ovate or lanceolate involucral bracts and the non-glandular chaff-tips. Although without data, the Wright specimen, since it is a complete plant with base and mature fruit, has been chosen as the type.

9. S. GATESII Mohr in Contrib. U. S. Nat. Herb. vi. 793 (1901). Ga., Tenn., Ala., Mo., Ark. and Okla. GEORGIA: woods, west slope of Lookout Mountain, May 30, 1911, *J. R. Churchill*. TENNESSEE: fence-rows, Lookout Mountain, Aug. 29, 1883, *J. D. Smith;* dry rocky hillside, Bull Run, west of Nashville, *H. K. Svenson*, no. 7326. ALABAMA: woods, St. Bernard, June 26, 1934, *W. Wolf;* Tensaw, *S. M. Tracy*, no. 8937; without data, *Bigelow*, *Buckley*. MISSOURI: dry

rocky ground, Shannon County, July 22, 1891, *B. F. Bush;* Monteer, *Bush*, nos. 162, 6536; Pleasant Grove, *K. K. Mackenzie*, no. 350; rocky glades near Pontiac, *E. J. Palmer*, no. 33204. ARKANSAS: along Fayetteville-Goshen highway, June 26, 1923, *J. T. Bucholz* (NY). OKLAHOMA: Cherokee Nation, August 18, 1895, *J. W. Blankinship.*

The leaves of *S. Gatesii* vary greatly in width and, when the specimen shows the lower part of the stem as well as the tip, very often the upper leaves are broader than the lower. The TYPE, dry exposed sterile places, Cullman, Alabama, June 28, 1895, *C. Mohr* (US, no. 784332) is intermediate between the extremes. Achenes with a shallow sinus, somewhat acuminate involucral bracts and glandular-pubescent chaff-tips are the strongest characters of this species.

Forma **truncatum**, f. nov., achaeniis truncatis. TENNESSEE: vicinity of Nashville, August, *Gattinger* in *Curtiss N. A. Pl.*, no. 1386 (TYPE in Gray Herb.). ALABAMA: Tensaw, *S. M. Tracy*, no. 8010.

This form differs from the species only in the achenes which have a wing about 0.2 mm. wide and a truncate apex.

10. S. MOHRII Small in Bull. Torr. Bot. Cl. xxiv. 493 (1897). GEORGIA: Lookout Mountain, July, 1900, *A. Ruth* (NY). TENNESSEE: dry oak barrens, Tullahoma, *H. K. Svenson*, no. 4264; Cumberland Mountains, July, 1897, *J. M. Bain* (NY). ALABAMA: upland woods, St. Bernard, July 12, 1934, *W. Wolf*; Cullman County, Sept. 25, 1898, *Eggert* (NY).

This species is readily distinguished from *S. Gatesii*, the one most resembling it superficially, by the shaggy pubescence of the stem and leaves, the spreading-erect involucral bracts, the roundish-obovate achenes with spreading teeth and the hispid chaff-tips.

11. S. BRACHIATUM Gattinger in Bot. Gaz. ix. 192 (1884). TENNESSEE: mountain near tunnel at Cowan, Franklin County, July 14, 1867, *Gattinger*, August 15, 1886, *Gattinger* (NY); Cumberland Mountains, Franklin Co., Sept. 10, 1898, *Eggert* (NY). ALABAMA: dry woods on limestone slopes of plateau, southeast of Woodland Mills, Morgan County, *R. M. Harper*, no. 3112 (NY).

Definitely petioled leaves with truncate or subhastate bases and a very open glabrous inflorescence of small heads, involucres 1–1.7 cm. broad, 1–1.5 cm. high, are the outstanding characters of this very distinct species. Since its relationship to the remaining species of the genus is not obvious, it is interesting to note that Gattinger's collection has suborbicular achenes with the apex scarcely more than retuse and the wing about 1 mm. wide; Harper's no. 3112 has achenes

with a definite sinus and better developed wing. This is just one instance of the instability of the achene-characters.

12. S. ATROPURPUREUM Retz. in Willd. Sp. Pl. iii³. 2334 (1804). WEST VIRGINIA: gravelly strand of stream, 2 miles west of White Sulphur, *L. F. & F. R. Randolph*, no. 1241. VIRGINIA: rich dry woods, Great Neck, *Fernald, Griscom & Long*, no. 4711; Wytheville, July 25, 1875, *H. Shriver* (B).

In two of the three specimens at hand there are good elliptical achenes larger than any found in a series of specimens of *S. trifoliatum* and lacking the obovateness characteristic of those of the latter species. These achene characters and the hirsuteness of the petiole are the essential features of *S. atropurpureum*. It is surely very closely related to *S. trifoliatum* and further material may prove it to be only a variety of the latter. At present it seems best to look upon it as a rare and possibly a relic species maintaining itself in a few undisturbed spots.

13. S. TRIFOLIATUM L. Sp. Pl. ii. 920 (1753). *S. ternifolium* Michx. Fl. Bor.-Am. ii. 146 (1803). *S. ternatum* Retz. in Willd. Sp. Pl. iii³. 2333 (1804). Pa., Ohio and Ind. south to N. C. and possibly Tenn. PENNSYLVANIA: meadows, Mercersburg, August, 1852, *T. C. Porter;* dry woods, 3 miles east of Waynesburg, *S. S. Dickey*, no. 65; Centre Co., *J. T. Rothrock*. MARYLAND: edge of woods along Chesapeake Canal, above Cabin John, *Leonard & Killip*, no. 663 (B). DISTRICT OF COLUMBIA: Washington, September 30, 1901, *E. S. Steele*. WEST VIRGINIA: dry field, White Sulphur Springs, July 4–6, 1914, *F. W. Hunnewell;* Great Cacapon, August, 1930, *W. M. Sharp;* Peter Mountain, *E. S. & Mrs. Steele*, no. 180. VIRGINIA: about Mount Crawford, *Heller & Halbach*, no. 1291; Wytheville, August 31, 1878, *H. Shriver;* edge of woods, Clarendon, *S. F. Blake*, no. 10866; Bedford Co., August 1, 1871, *A. H. Curtiss;* Salt Pond Mountain, August, 1890, *W. M. Canby;* dry mixed woods, Little Neck, *Fernald & Long*, no. 4254; swampy woods, London Bridge, *Fernald & Long*, no. 4255. NORTH CAROLINA: Asheville, *B. L. Robinson*, no. 38; open woods, Biltmore, *Biltmore Herb.*, no. 3434ᵇ. OHIO: Geauga Lake, *R. J. Webb*, no. 542; Hiram Township, July 18, 1904, *R. J. Webb;* Berea, July, 1897, *G. B. Ashcroft;* waste places, Richland County, August 18, 1893, *E. Wilkinson;* Columbus, October 1, 1904, *H. A. Gleason;* Turkey Creek bottoms, Friendship, *D. Demaree*, no. 10786. INDIANA: dry clay soil along roadside, 2 miles northwest of Cherubusco, *C. C. Deam*, no. 54242; sandy roadside, about 5 miles northeast of Wolcottville, *C. C. Deam*, no. 54101; woods just north of Diamond Lake, *C. C. Deam*, no. 54136; woods on the north side of Crooked Lake, *C. C. Deam*, no. 54448.

Although the prevailing number of specimens collected have verticillate leaves, there are some, without question belonging to this species, with opposite and some with alternate leaves. As early as 1871 Curtiss collected a series of plants to show this variation in leaf-arrangement. In *Biltmore Herb.*, no. 3434[b], the achenes show a tendency to be truncate. One specimen from TENNESSEE, *Poorland Creek*, Union County, *J. K. Underwood*, no. C. C. D. 130, is cited with some hesitation. The achenes are broader and shorter than in the typical and the peduncles are sparsely hispidulous.

Forma **praecisum**, f. nov., achaeniis truncatis. VIRGINIA: Lexington, August 28, 1924, *J. R. Churchill* (TYPE in Gray Herb.).

Differing from the typical only in that the achenes are truncate and the wing-margin is reduced.

Var. LATIFOLIUM Gray, Syn. Fl. N. A. i.[2] 241 (1884). *S. laevigatum* Ph. Fl. Am. Sept. ii. 578 (1816); Ell. Sk. ii. 466 (1823). *S. glabrum* Eggert in Small, Fl. Se. U. S. 1243, 1340 (1903). S. C., Ohio, Ind., Tenn. and Ala. SOUTH CAROLINA: Santee Canal, *Ravenel.* OHIO: Berlin Heights, August 15, 1914, *L. H. MacDaniels.* INDIANA: along creek, about 3 miles north of Salem, *C. C. Deam*, no. 9410. TENNESSEE: dry fields, Grand Junction, *H. K. Svenson*, no. 4361 (B). ALABAMA: Tuscaloosa, 1878, *G. R. Vasey;* prairies, July, 1840, *Buckley;* rocky mountain sides, Blount County, August 27, 1884, *J. D. Smith;* chalk barrens, West Greenville, *Harper & Svenson*, no. 7385 (B); chalk prairie about 2 miles northwest of West Greene, *R. M. Harper*, no. 3427 (B).

The achenes and inflorescence of var. *latifolium* are not separable from those of typical *S. trifoliatum.* In all the collections noted the leaves are opposite and smooth. Unfortunately the basal leaves are lacking from all except *Harper*, no. 3427, *Harper & Svenson*, no. 7385 and *J. D. Smith.* The first two have basal leaves with very short petioles as in *S. confertifolium* but the cauline leaves are more numerous and the achenes have not the shallow sinus characteristic of those of the latter species. This character of the basal leaves is something which should be carefully observed in field work.

14. S. CONFERTIFOLIUM Small, Fl. Se. U. S. 1243, 1340 (1903). ALABAMA: Cocoa, Choctaw County, October 13, 1896, *C. Schuchert* (TYPE in New York Bot. Gard.).

At present this species is separable from *S. trifoliatum*, var. *latifolium* by the fewer and greatly reduced stem-leaves, and the shallower sinus and blunter wing-tips of the achenes. The specimens, *Harper*, no. 3427 and *Harper & Svenson*, no. 7385, make the basal

leaf-character of little value or they rightfully belong to this species and the achene character is inconstant. Too often in this genus a single specimen or two or three plants will appear to have distinctive characters which, as a matter of fact, break down in a good series of representative material.

15. S. ASTERISCUS L. Sp. Pl. ii. 920 (1753). *S. scabrum* Walt. Fl. Carol. 217 (1788)? *S. scaberrimum* Ell. Sk. ii. 466 (1823)? *S. helianthoides* Greene, Pittonia, iv. 43 (1899). N. C., Tenn., Ala., Mo., Ark. and Okla. NORTH CAROLINA: Cullowhee, 1887, *R. Thaxter;* vicinity of Faith Post Office, Rowan County, August 14, 1891, *Small & Heller;* rich sandy bank, 10 miles south of Greensboro, *Wiegand & Manning*, no. 3322. TENNESSEE: Knoxville, August 29, 1900, *A. Ruth.* ALABAMA: no data given. MISSOURI: Shannon County, *B. F. Bush*, no. 34. ARKANSAS: low shaded woods, Hot Springs, *F. J. Scully*, no. 364. OKLAHOMA: near Idabel, *H. W. Houghton*, no. 3902.

A composite set of citations, recorded here with great reluctance. Of all the species of this genus of unstable characters, *S. Asteriscus* has been the most difficult to define. In the Linnean Herbarium there is no type-specimen but Dr. Gray has chosen the type thus, "Spec. ii. 920 (*Dill. Elth.* t. 37, f. 42)." On looking over the Linnean description and references, this seems logical. Hort. Cliff. 494, is without description and merely directs one's attention to the work of Dillenius. Gronovius's description is somewhat questionable, and no specimens from Virginia have been referable to this species. Granted that the Dillenian plate has been accepted as the type, the question now arises which of the entities included at some time in this species is the true *S. Asteriscus. S. Gatesii, S. dentatum and S. scaberrimum* all have possibilities in an attempt to match the Dillenian plate. By process of elimination *S. Gatesii* was rejected as it is not found in Carolina. It has been harder to make the choice between the other two. Unfortunately none of Elliott's types of *Silphium* are in his herbarium at the Charleston Museum and, although various leads have been followed up, the types have not been located. With the aid of specimens *S. dentatum* is reasonably easy to interpret, but *S. scaberrimum* is puzzling. Since the majority of specimens of *S. dentatum* have glabrous stems and peduncles it seems reasonable to conclude that Dillenius probably did not have this plant. *S. scaberrimum* is left. The type-locality of this species is "in the western districts of Georgia." Although the plants named *S. scaberrimum* by Dr. Gray seem to fit the description, at least superficially, they belong to an

entirely different species-relationship (assuming *S. scaberrimum* belongs in the narrow-winged achene-group) and have a different range (Texas and Louisiana). In the herbarium of the New York Botanical Garden there are specimens from the mountains of Georgia labeled *S. scaberrimum* which appear comparable to the ones above cited from North Carolina and Tennessee; so, for lack of a better disposition of this puzzling species, *S. scaberrimum* is here taken to be a synonym of *S. Asteriscus*.

16. S. DENTATUM Ell. Sk. ii. 468 (1823). *S. Elliottii* Small, Fl. Se. U. S. 1243 (1903). *S. incisum* Greene, Pittonia, iv. 45 (1899). N. C. to Ga. and Ala. NORTH CAROLINA: sandy soil near Chimney Rock, *Biltmore Herb.* no. 7415; without data, *Gray*. SOUTH CAROLINA: sandy roadside bank, 4 miles south of Kingstree, *Wiegand & Manning*, no. 3326; Greenville, July 21, 1881, *J. D. Smith*. GEORGIA: lowland by river, Athens, *L. M. Perry*, no. 1092; base of Stone Mountain, July 4, 1893, *J. K. Small;* open woods, base of Stone Mountain, *A. H. Curtiss*, no. 6515; alluvial banks of Bull Creek, 4 miles east of Columbus, September 7, 1883, *J. D. Smith;* middle Georgia, 1846, *T. C. Porter*. ALABAMA: Talladega County, *F. S. Earle*, no. 984 (TYPE of *S. Elliottii*, NY).

This is indeed a variable species but no combination of characters has been found by which it may be broken up. The specimens from North Carolina, South Carolina and the Piedmont region of Georgia have glabrous stems and peduncles, and opposite or alternate leaves. The collections, *J. D. Smith* and *Earle*, no. 984, have pubescent peduncles, and *T. C. Porter* has a pubescent upper stem. The sinus of the achenes varies from 0.5 to 1.5 mm. deep and the wing-tips are rounded or obtuse. Several specimens labeled *S. Elliottii* seem to have been collected from the same localities as *S. dentatum* and surely show no more than a variation in the leaf-margin. *S. incisum* Greene looks like an abnormal plant of this species.

Forma **nodum** (Small), comb. nov. *S. nodum* Small, Man. 1413 (1933). SOUTH CAROLINA: Charleston Neck, 1855, *L. R. Gibbes* (TYPE of *S. nodum*, NY); Troy, *J. Davis*, no. 2046. GEORGIA: McGuire's Mill, Gwinnett County, *Biltmore Herb.*, no. 7415[b].

Var. **angustatum** (Gray), comb. nov. *S. Asteriscus*, var. *angustatum* Gray, Syn. Fl. N. A. ed 2: i[2]. (suppl.) 449 (1886). *S. lanceolatum* Nutt. Trans. Amer. Phil. Soc. vii. 341 (1840). *S. angustum* Small, Fl. Se. U. S. 1244 (1903). GEORGIA: dry pine-barrens about 3 miles south of Moultrie, *R. M. Harper*, no. 1947. FLORIDA: Chattahoochee, September 3, 1884, *A. H. Curtiss* (TYPE of *S. Asteriscus*, var. *angustatum*), *Curtiss*, no. 5946; River Junction, *G. V. Nash*, no. 2379; sandy roadside by woods, 4 miles west of Madison, *Wiegand & Manning*, no. 3323.

This is a slenderer and perhaps a smaller plant than the typical. Very little of the material seen yields mature achenes; those found do not justify raising this to specific rank, although the narrowly lanceolate leaves and the pubescent stem with relatively few heads render it strikingly different from the typical in general appearance. The last cited specimen has a heavier stem, broader leaves and unusually large heads. This is perhaps owing to the cultivation it may have received on the roadside.

17. S. TEREBINTHINACEUM Jacq. Hort. Vindob. i. 16, t. 43 (1770). Ont., Mich. and Wisc. south to Tenn. and Mo. ONTARIO: Windsor, *Macoun* (NY). MICHIGAN: introduced, Burt Lake, *F. C. & M. T. Gates*, nos. 9248, 9830 (B). OHIO: Toledo, Aug. 11, 1884, *H. A. Young*. TENNESSEE: dry open ground, Knoxville, *A. Ruth*, no. 65. WISCONSIN: without data, *I. A. Lapham;* South Madison, August 30, 1893, *J. R. Churchill;* Madison, *N. C. Fassett*, no. 14975. ILLINOIS: without data, *Buckley;* South Chicago, *H. H. Smith*, no. 5736; Napierville, August 24, 1897, *L. M. Umbach;* Aurora, August, 1883, *T. E. Boyce;* Urbana, *A. S. Pease*, no. 12490; Normal, August, 1886, *B. L. Robinson;* Peoria, August, 1904, *F. E. McDonald;* Augusta, August, 1847, *S. B. Mead*. MISSOURI: Meramec Heights, *E. E. Sherff*, no. 1137; Green County, September 13, 1890, *S. Weller*.

Var. PINNATIFIDUM (Ell.) Gray. Man. ed. 1:220 (1848). *S. pinnatifidum* Ell. Sk. ii. 462 (1823). *S. chicamaugense* Canby in Bot. Gaz. xxvii. 319 (1899). Ga., Ohio, Tenn. and Ala. GEORGIA: along Chickamauga Creek, near Ringgold, August 6–12, 1895, *Small* (NY). OHIO: without data, *Sullivant*. TENNESSEE: Cedar Glades, Lavergne, *Gattinger* (NY); Rutherford County, September 7, 1898, *H. Eggert* (NY). ALABAMA: near Huntsville, October, 1843, *Rugel* (NY).

18. S. RUMICIFOLIUM Small in Bull. Torr. Bot. Cl. xxv. 145 (1898). TENNESSEE: dry sterile soil, Knoxville, *A. Ruth*, no. 4024 (TYPE in New York Bot. Gard.).

The heads of *S. rumicifolium* and of *S. terebinthinaceum* are too much alike to give the former clear-cut definition. Although the leaves are of different outline, further material is needed to justify keeping this plant as a species.

19. S. COMPOSITUM Michx. Fl. Bor.-Am. ii. 145 (1803). *S. laciniatum* Walt. Fl. Carol. 217 (1788), non L. *S. sinuatum* Banks ex Pursh, Fl. Am. Sept. ii. 577 (1816), in synon. *S. terebinthinaceum*, var. *sinuatum* Curtis in Bost. Journ. Nat. Hist. i. (reprint) 103, 127 (1834?). *S. nudicaulis* Curtis in Bost. Journ. Nat. Hist. i. 127 (1837?). *S. compositum* α. *Michauxii* T. & G. Fl. N. A. ii. 276 (1842). *S. collinum* Greene, Pittonia, iv. 44 (1899)? *S. lapsuum* Small, Man. 1411 (1933). Va. to Ga. and Tenn. VIRGINIA: dry woods, Blackwater School, *Fernald, Long & Smart*, no. 5943; dry sandy pine woods about 3 miles

southeast of Petersburg, on headwaters of Blackwater River, *Fernald, Long & Smart*, no. 5944. NORTH CAROLINA: clearings around Highlands, August 29, 1882, *J. D. Smith;* open woods, summit of Satoola Mountain, Macon County, August 30, 1882, *J. D. Smith;* Cullowhee, June–July, 1887, *R. Thaxter;* dry woodlands, near Biltmore, *Biltmore Herb.*, no. 4595b; middle country of N. C., August, 1841, *Gray & Carey*. SOUTH CAROLINA: dry oak-pine woods, 2 miles north of Kingstree, *Wiegand & Manning*, no. 3329; open woods, Caesar's Head, August 13, 1881, *J. D. Smith*. GEORGIA: North Georgia, 1875, *C. Wright;* oak woods, Augusta, July 17, 1898, *A. Cuthbert* (TYPE of *S. lapsuum*, NY). TENNESSEE: Wolf Creek, August 30, 1898, *A. Ruth*, no. 59.

The specimen collected at Caesar's Head has achenes with narrower wing than in the typical and with a tendency for the awns to disappear; some achenes are almost truncate and others have short awns. In the specimen, *C. Wright*, the leaves are as broad as or broader than long, toward var. *reniforme*, and in *A. Cuthbert* one of the plants has a scabrous upper leaf-surface. The synonymy is sufficient to indicate that this is a variable species. Several collectors have recently reclaimed this species for the manual range, but it is recorded in early botanical works by both Pursh and Curtis. The latter says "I have traced this plant through the lower part of this State [North Carolina] into Virginia and S. Carolina, and find it constantly preserving its character."

Forma **orae** (Small), comb. nov. *S. orae* Small, Man. 1411 (1933). NORTH CAROLINA: Wilmington, *M. A. Curtis* (TYPE of *S. orae*, NY); Southern Pines, July 19, 1895, *J. W. Blankinship;* dry sandy bank by woods, 12 miles west of Cary, *Wiegand & Manning*, no. 3328; Cumberland Co., 1845, *Curtis;* dry sandy soil, open woods, Rockingham, *L. F. & F. R. Randolph*, no. 1051. SOUTH CAROLINA: dry sandy oak woods, 10 miles south of Monks Corner, *Wiegand & Manning*, no. 3330.

This differs from *S. compositum* in the more finely cut or pinnatifid leaves.

Var. RENIFORME (Raf. ex Nutt.) T. & G. Fl. N. A. ii. 276 (1842); Syn. Fl. i². 242 (1884). *S. reniforme* Raf. Med. Fl. ii. 263 (1830), name only; Nutt. in Trans. Amer. Phil. Soc. vii. 342 (1840). *S. terebinthinaceum sensu* Ell. Sk. ii. 463 (1823), non Jacq. VIRGINIA: on disintegrating shale, vicinity of Millboro, August 31, 1906, *E. S. Steele*. NORTH CAROLINA: Burke, *M. A. Curtis;* Highlands, September, 1906, *T. G. Harbison*.

The first two specimens named have slightly scabrous or pubescent leaf-surfaces; the third is perfectly smooth.

20. S. VENOSUM Small in Bull. Torr. Bot. Cl. xxv. 478 (1898). GEORGIA: St. Mary's River swamp, below Trader's Hill, Charlton County, June 12–15, 1895, *J. K. Small* (TYPE in New York Bot. Gard).

A very distinct species with involucres up to 2 cm. broad and suborbicular achenes with acute wing-tips.

21. S. OVATIFOLIUM Small, Fl. Se. U. S. 1242, 1340 (1903). *S. compositum*, γ. *ovatifolium* T. & G. Fl. N. A. ii. 277 (1842); var. *ovatifolium* Gray, Syn. Fl. i². 241 (1884). FLORIDA: without data, *Chapman;* near Aspalaga, July 1843, *Rugel* (NY); dry pine barrens, near Argyle, *A. H. Curtiss*, no. 5941; dry sandy oak woods, 2 miles east of Alachua, *Wiegand & Manning*, no. 3331.

A species with markedly variable leaves but rather distinctive orbicular achenes with obtuse wing-tips and narrow sinus.

22. S. ALBIFLORUM Gray in Proc. Amer. Acad. xix. 4 (1884). TEXAS: Dallas, June, 1878, also 1883, *J. Reverchon;* dry hills, Polytechnic, July 10, 1912, *A. Ruth*, no. 71; plains, Tarrant County, June 25, 1911, *A. Ruth*, no. 71; Weatherford, *S. M. Tracy*, no. 8330.

The venation of the leaves is more noticeable in this species than in *S. laciniatum*.

23. S. LACINIATUM L. Sp. Pl. ii. 919 (1753); Robinson in Bot. Gaz. xvi. 114, 115 (1891). Wisc., Ill., Minn., south to Oklahoma and Texas. WISCONSIN: Shutesbury, July 23, 1883, *W. H. Manning*. ILLINOIS: without data, *S. B. Mead;* South Chicago, *H. H. Smith*, no. 5707; Champaign, July 26, 1899, *H. A. Gleason;* Champaign, *A. S. Pease*, no. 12410; Bloomington, August, 1886, *B. L. Robinson;* dry prairies, Peoria, July, 1890 and September, 1891, *Frank E. McDonald*. MINNESOTA: Millpond, near Pine Island, Goodhue County, July 13, 1891, *E. A. Mearns*. IOWA: Dallas County, August 1, 1867, *J. A. Allen;* prairies, Decatur County, July 21, 1897, *T. J. & M. F. L. Fitzpatrick*. MISSOURI: Nevada, *W. L. McAtee*, no. 3049. KANSAS: prairies, Riley County, *J. B. Norton*, no. 252. OKLAHOMA: near Tonkana, *G. W. Stevens*, no. 1819. TEXAS: Dallas, June, 1875, *J. Reverchon*.

A second sheet collected by *Mead* in Illinois shows the upper leaves practically entire. This appears to be only an extreme form of variable foliage.

The above collections and those of the variety below have hitherto been known as *S. laciniatum*. There is, however, a difference in the pubescence and the distribution of the two. The collections of more southern range usually have the involucres and chaff, and often the stems, copiously glandular or, in the older specimens, as if the resinous juice had oozed out in minute droplets. This would naturally be taken for the typical variety, since Linnaeus cited his type as "Mis-

sissippi. *Collinson.*" Mr. C. A. Weatherby, who most obligingly examined the type for me, found the specimen was not actually collected in "Mississippi" but from a plant grown in the Upsala garden, and it was *not glandular*. This is rather surprising in view of Linnaeus's description, "Caulis . . . inferne laevis, superne tuberculis fuscis pilisque patulis albis scaber." However, the northern and more wide-spread plant is to be regarded as the typical and the southern is here set forth as var. *Robinsonii* in tribute to Dr. B. L. Robinson who, as early as 1891, carefully described this variation and asked for information concerning its range and the possible occurrence of intermediate forms.

Var. **Robinsonii**, var. nov., cauli et involucris glandulosis exigue scabro-hirsutis vel hispidis. Ky., Ala., Miss., La. and Okla. KENTUCKY: barrens, 1835, *C. W. Short* (TYPE in Gray Herb.). ALABAMA: ½ mile northwest of Rosemary, *R. M. Harper*, no. 3251 (NY); chalk barrens, West Greenville, *Harper & Svenson*, no. 7384. MISSISSIPPI: Agricultural College, Oktibbeha County, *C. L. Pollard*, no. 1333. LOUISIANA: without data, *Hale* in part. OKLAHOMA: open place in woods, near Page, *G. W. Stevens*, no. 2740.

II. THE NOMENCLATURE OF THE VERTICILLATE EUPATORIA

K. M. WIEGAND AND C. A. WEATHERBY

(Plates 466–468)

THE purple-flowered, verticillate-leaved Eupatoria of eastern North America have had a confused and highly unsatisfactory nomenclatural history. Linnaeus described two species in the group in 1753, *Eupatorium trifoliatum*, and *E. purpureum*, with an unnamed variety; and in 1755 he added a third, *E. maculatum*. For our present purposes it is not necessary to trace in detail the ineffectual struggles of Linnaeus's successors to apply his three names and to account for the different variants concerned. It will be enough to consider somewhat the work of the three American authors who have especially studied the group.

These are: Dr. Joseph Barratt,[1] the senior author of this paper,[2]

[1] Eupatoria Verticillata. Middletown, Connecticut. 1841. 1 folio sheet. For an account of this rare little work, see RHODORA xxiii. 173 (1921).

[2] RHODORA xxii. 57–70 (1920).

and Mr. K. K. Mackenzie.[1] The last two were in perfect taxonomic agreement; and although he subdivided one of three species which he knew, Barratt's treatment is in essential accord with theirs. But no two applied the Linnaean names alike. The following table shows the different nomenclatural schemes; the numbering of species is that used by Wiegand and Mackenzie.

	Barratt	Wiegand	Mackenzie
1.	E. maculatum L. E. ternifolium Ell.	E. verticillatum Lam.	E. purpureum L.
2.		E. maculatum L.	E. Bruneri Gray
3.	E. fistulosum Barratt	E. purpureum L.	E. maculatum L.
4.	E. purpureum L.	E. falcatum Michx.	E. trifoliatum L.[2]

This was a truly lamentable, indeed an intolerable, condition. Since it arose because, for various reasons, all three authors had depended chiefly on their interpretations of the descriptions and citations of Linnaeus,[3] the obvious remedy was to look up whatever specimens were back of the original literature and, whether or not they proved technically types, to treat them as such, as the only possible basis of future uniformity. Accordingly, in 1935, the junior author undertook to examine, so far as possible, the extant material concerned; and, through the kindness of the authorities of the Rijksherbarium at Leiden, the British Museum, the Linnean Society of London and the botanical establishment of Oxford University, he was able to see, we believe, all that remains. The result is happy in that it establishes beyond reasonable doubt, the claim of Linnaeus's specimens to be taken as types of his species; it is far less pleasing in that it compels a fourth arrangement of the names. But at least it places that arrangement on a definite basis of actual, existent herbarium material (the object and peculiar virtue of the "type method") and in so far may hope for permanence.

Before considering Linnaeus's own specimens, it may be well to

[1] Rhodora xxii. 157–165 (1920) and xxix. 6–9 (1927).

[2] As will later appear, each author was right as to one of the Linnaean names, none right as to more than one.

[3] Barratt, indeed, consulted Dr. Gray, then just back from his first European journey, as to the identity of the Linnaean specimens. The senior author studied poor photographs of them in the Gray Herbarium, and Mackenzie later procured others. In neither case did they prove wholly reliable guides.

How far astray one may go by the purely interpretative method is well illustrated by Mackenzie's insistence that Linnaeus's description of *E. purpureum* was drawn from a specimen of species no. 1. As will appear later, there is every evidence that the description was drawn from all the Linnaean specimens, none of which is species no. 1.

TYPE OF EUPATORIUM PURPUREUM IN HERBARIUM OF LINNAEUS

STERILE SPECIMEN OF EUPATORIUM PURPUREUM IN HERBARIUM OF LINNAEUS

clear the way by some account of those representing his synonyms. Under *E. purpureum*, Linnaeus placed citations from Colden, Gronovius, Cornut and Morison. No specimens of Colden or Cornut are known to exist. Clayton 162, the collection on which the Gronovian reference rests, cannot be found at the British Museum. Some wretched scraps of Morison's are extant—two small branches of a young inflorescence and a single detached leaf. They may be species no. 2, but are hardly to be certainly identified. Fortunately, since he merely took his plate and description from Cornut, his specimens are of little importance in determining anything. So far, then, as existing herbarium material is concerned, *E. purpureum* depends wholly on what Linnaeus himself had.

The case of *E. maculatum* is not so simple. Under *E. purpureum* β (later included in *E. maculatum*), Linnaeus cited his own Hortus Cliffortianus, Royen, Hermann, Morison and Ray. No specimens of Royen (who, in any case, merely cited Hort. Cliff.) nor of Hermann are known. A Clifford specimen is preserved at the British Museum; it is species no. 1 (*E. verticillatum* of Wiegand). Morison and Ray merely applied Hermann's phrase-name, but it is of some interest, as showing their interpretation of it, to note that Morison's specimen, though again a mere fragment, is probably species no. 1 and that the Vernon collection cited by Ray certainly is. Hermann's plate in all probability represents the same species and was so assigned both by the senior author and by Mackenzie. The variety, therefore, was originally quite consistent; had Linnaeus been content merely to raise it to specific rank, all would have been well. Unfortunately for us, he, or Juslenius, in proposing *E. maculatum*, associated with these citations a specimen or specimens from which the description was drawn and which, therefore, must determine the application of the name.

Linnaeus's own specimens are three in number. One is labelled in his hand "11. H. U. purpureum." A photograph of it, procured for us by the courtesy of the Linnean Society, is reproduced in plate 466. It will be noted that this shows a condition to be found in an occasional individual in almost any large colony of verticillate Eupatoria, in which the leaves are not exactly opposite in the whorl. The stem has been shaved off on one side to reduce thickness and one or more leaves of the lower whorl have probably been removed thereby. The leaves are rather thin, nearly glabrous and smooth above, pubescent on the

nerves beneath with weak, multicellular hairs up to 1 mm. long. The stem is greenish. The branches of the inflorescence are densely sordid-puberulous. The involucres are 6 mm. high, the corollas about 5.5 mm. long, projecting 2.5–3 mm. The inflorescence is so matted together in pressing that it is not possible to make out clearly the number of florets without detaching and dissecting a head—and one does not do that with Linnaean specimens.

Pinned to the sheet bearing this specimen is another (plate 467) containing the top of a young sterile shoot obviously of the same species. On this sheet Linnaeus has written: "genicul. purpurp."—nodes purple.

The third sheet (plate 468) is labelled, also in Linnaeus's hand, "K 11 maculatum" and at the base of the stem is written "fl. 8 maculatum." In this specimen the leaves are thicker than in nos. 1 and 2, glabrous above except for a short puberulence on the nerves. From the little of the lower surface which can be seen, they seem to be rather densely glandular and more or less pubescent beneath. The branches of the inflorescence and the stem to the first whorl of leaves are densely sordid-pubescent; below the stem is glabrous, rather evenly purple, but with faint darker lineolae. The involucre is 7.5 mm. high. Except in one or two heads the corollas are scarcely developed, but appear to be 5.5–6 mm. long.

For the sake of clarity of discussion it may be well at this point to quote the original diagnosis and description of *E. purpureum*. They are:

> EUPATORIUM foliis subverticillatis lanceolato-ovatis serratis petiolatis rugosis . . .
> Caulis *teres, erectus, viridis, punctis linearibus longitudinalibus purpurascentibus.* Folia *terna, quaterna, s. sena, lato-lanceolata s. lanceolato-ovata, serrata, rugosa, scabriuscula, petiolata, utrinque viridia.* Corymbus *terminalis.* Calyces *florum incarnati.* Flosculi *octo, Corollis albidis, Antheris purpureis, stylis longissimis.*

There is nothing here which could not have been taken from one or another of Linnaeus's specimens, and there are certain phrases which must have been. "Foliis subverticillatis," "caulis viridis," "folia terna" apply to specimen no. 1; "flosculi octo" is Linnaeus's own inscription on specimen no. 3; "corollis albidis" would naturally come from observation of the plant in the Upsala garden (specimen no. 1). And no such characters as these are mentioned in any of the literature cited.

The original diagnosis and description of *E. maculatum* as published in Centuria I Plantarum 27 (1755) was as follows.

EUPATORIUM (*maculatum*) foliis quinis, lanceolatis, aequaliter serratis, petiolatis, venosis.

Descr. Folia quinque ad genicula, lanceolata, aequaliter serrata. *Caulis* tenuissime maculatus. Varietas *Eupatorii purpurei* ad hoc, ut & ejus synonyma & descriptio spectant. Eupatorium enim *purpureum* foliis quaternis, lanceolato-ovatis, inaequaliter serratis, rugosis est.

Mackenzie pointed out that in editing this for the Amoenitates Linnaeus added "tomentosis" to the diagnosis and "vel sex" to the description (thus bringing them into better accord with his own specimen) and that Kalm is not cited as collector though he is so cited in other passages of the Centuria. From this and from the fact that the leaves are described as in fives but are actually in sixes in the Linnaean specimen, Mackenzie argued that the description must originally have been drawn from some other specimen. The possibility may be admitted. It may even be added that Linnaeus's account of the leaves as ovate-lanceolate in *E. purpureum* and lanceolate in *E. maculatum* is not borne out by his specimens, in which there is little difference in the shape of the leaves (and what there is rather in the reverse direction) and that this also might be interpreted as indicating the use of other material.

But all this is guess-work. It might also be *guessed* that Linnaeus drew his "quinis" from the circumstance that in his specimen no. 3 one of the leaves of the lower whorl is partly broken off behind the stem so that at first glance the whorl appears to consist of five leaves only; and that the additions in the Amoenitates were merely a perfecting of the description. And much can be explained on the ground of pure carelessness. In any case, the fact remains that Linnaeus's specimen was obviously included in his conception of the species and that it is all we now have to represent that conception. We must either take it as representative or resign ourselves to mere speculation.

Further evidence is to be found in Linnaeus's annotated and interleaved copy of the first edition of the Species Plantarum. From the original diagnosis of *E. purpureum* he has here crossed out "subverticillatis" and substituted "quaternis," and before "serratis" has inserted "inaequaliter." On the interleaf opposite he wrote: "Folia quina, ovato-lanceolata inaequaliter serrata et fere [word illegible] Genicula caulis ferruginea. Flores ut in sequenti sed panicula parva diversa."[1] Under var. β he crossed out both the citations and the

[1] Linnaeus's handwriting is here presumably hasty and far from readily legible. But with the kindly aid of Messrs. Savage and Pugsley of the Linnaean Society and Dr. Uggla of Upsala, who happened to be at Burlington House at the time, working on Linnaeus's correspondence, all but one word was definitely made out.

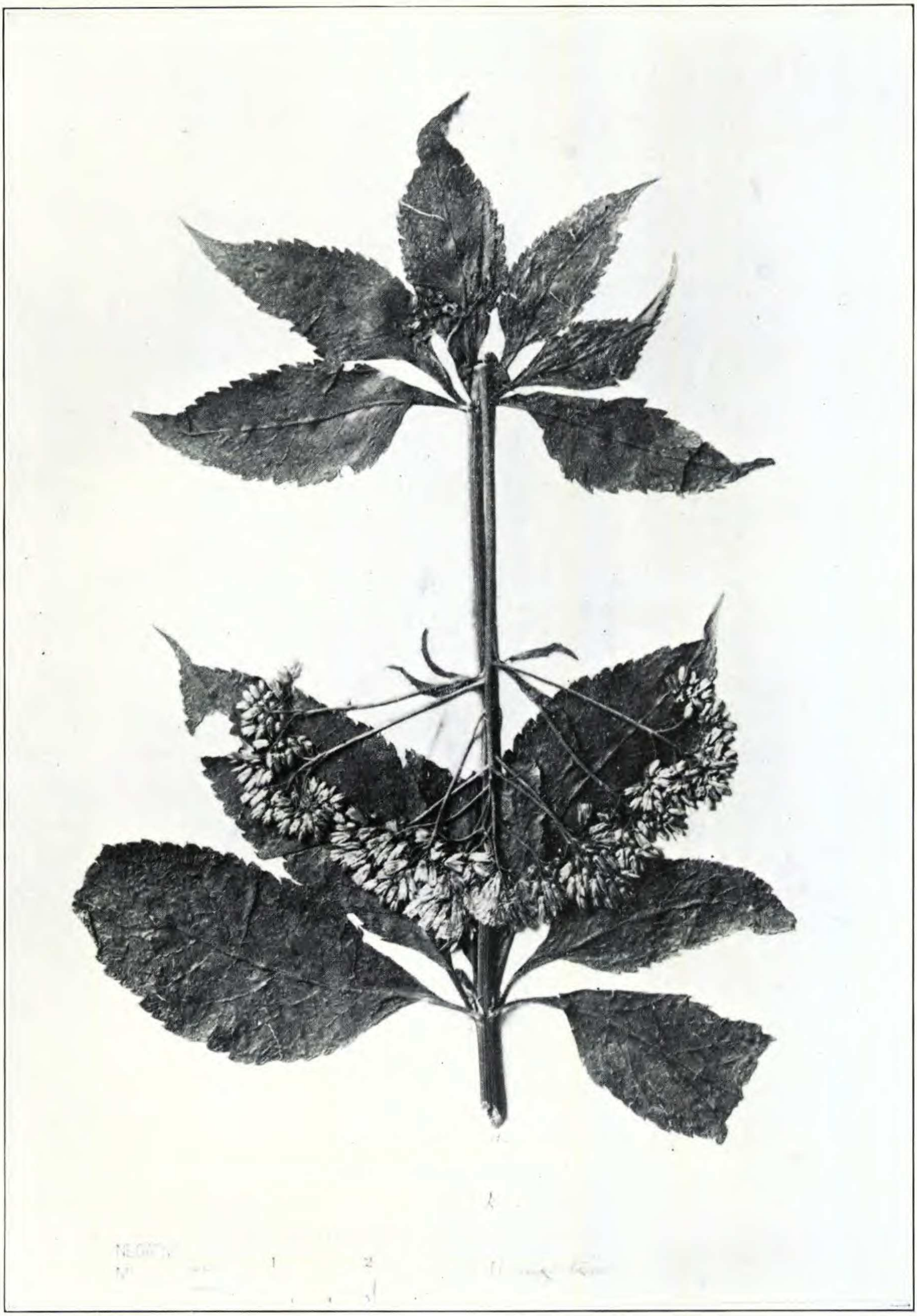
description following. Opposite the former he wrote in on the interleaf the diagnosis of *E. maculatum* as published in the Amoenitates. He first wrote "foliis subverticillatis" but crossed out the latter word and substituted "quinis." Below, opposite the description, he wrote: "folia [4s. crossed out] 5 ad genicula lanceolata aequaliter serrata caulis tenuissime maculatus. Ergo differt foliis aequaliter serratis."

There is no direct evidence to show whether these notes were made before or after the publication of the Centuria; in character, however, they are the memoranda of one seeking tenable marks of distinction between two contemplated species, and would, most probably, have come before. In them, the phrase "genicula caulis ferruginea" is a paraphrase of the note accompanying specimen no. 2; "panicula parva diversa" not only accurately described specimen no. 1 as contrasted with no. 3 (see plates), but could have sprung from no other extant source. The crossing out of "foliis subverticillatis" would have been the natural result of discovering, or suspecting, that this was not the normal condition. And though "aequaliter" and "inaequaliter" are not, to our eyes, accurately descriptive terms for it, there is a difference in the serration of the leaves. The teeth in specimen no. 3 are distinctly narrower, more falcate, and more sharply pointed than in nos. 1 and 2. And again this distinction could have been drawn only from these specimens or others like them.

Finally, for the second edition of the Species Plantarum, Linnaeus wrote a revised description of *E. purpureum*, omitting the phrase "punctis linearibus longitudinalibus purpurascentibus," which applied to specimen no. 3 and substituting "ad exortum petiolorum purpurascens" which describes specimens 1 and 2. The deleted phrase about the punctate stem he transferred to *E. maculatum*. Presumably through haste or carelessness he did not transfer "flosculi octo" which should also have gone; and he allowed the "folia quina" written into his notes to stand in the description, though in the formal diagnosis the number is given, correctly for specimen 2, as four.

Mackenzie argued that one should not go beyond what Linnaeus did in the first edition. With this we could agree if the subsequent changes were real changes. But if, in his later contributions, Linnaeus merely attempted to clarify his first treatment, these should be given weight. Apparently, almost certainly, this is exactly what he was trying to do.

We have, then, three specimens, two from the Upsala garden, repre-



TYPE OF EUPATORIUM MACULATUM IN HERBARIUM OF LINNAEUS

senting a plant which Linnaeus must have seen growing, and one from Kalm, whose collections he named. He certainly studied them to the extent of making descriptive notes on two of the sheets; and there is every evidence that the annotations which accompany his attempts to distinguish his two species were drawn largely from them. Nos. 1 and 2 are the only material extant to represent his conception of *E. purpureum;* and, even if other specimens were used in drawing up the original description of *E. maculatum* (as distinguished from the citations associated with it), no. 3 is all that remains. That Linnaeus's work was, by modern standards, none too accurate for these particular specimens, does not matter; what is important is that he did work with them. They have every claim to be taken as types—indeed, there is no other reasonable alternative.

Now as to their identity. The combination, in specimens 1 and 2, of solid stem with purple color only at the nodes, leaves in threes or fours, somewhat soft-pubescent beneath and with broad, but pointed, serrations, and (young) corollas 5.5 mm. long, plus the general habit, places these specimens definitely in species no. 4, *E. falcatum* of Wiegand's treatment, *E. trifoliatum* of Mackenzie's.[1] It is interesting that Torrey & Gray and later Gray himself, as judged by their text comments, interpreted *E. purpureum* in this sense, though, as shown by their joint and several determinations of specimens, they had no very clear idea of its characters and confused it with *E. fistulosum* Barratt (species no. 3). Barratt, as noted above, applied the name *E. purpureum* as did Torrey and Gray. So did Britton, Ill. Fl. ed. 2, iii. 357 (1913), at least so far as his figure and synonymy are concerned.

Specimen no. 3 is quite clearly species no. 2, *E. maculatum* of Wiegand's treatment, *E. Bruneri* of Mackenzie's. The leaves are in sixes, a number frequent also in species 3, but the stem is solid and is still faintly lineolate, the leaves are more sharply serrate than is usual in species 3 and the whole aspect is that of species 2. The florets are, as stated by Linnaeus, eight, a rather low number for species 2, but high for species 3. The length of the corollas, if accurately measured, is within the maximum for the species, as shown by several indubitable specimens in the Gray Herbarium. Coulter & Nelson, Man. Rocky Mt. Fl. 485 (1909) appear to be the only authors previous to Wiegand who have applied the name *E. maculatum* in this sense.

[1] This determination was made by the junior author in London. On his return, he submitted the photographs here reproduced and his notes, but not his determination, to the senior author who made the same determination independently.

Most writers have, following the Linnaean citations, used it for species 1.[1]

E. trifoliatum L. was based primarily on a citation from Gronovius and this on Clayton's specimen no. 620. This specimen was inspected by Blake[2] and later by the junior author. It is species 4, *E. purpureum* as we now understand it. *E. trifoliatum*, which precedes *E. purpureum* in the Species Plantarum, was apparently first united with the latter by Torrey & Gray under the name *E. purpureum*. The latter is therefore valid according to the International Rules.

The name *E. verticillatum* Lam., applied by the senior author in 1920 to species 1, cannot, unfortunately, stand under present rules. In publishing it, Lamarck cited as synonyms, under his plants α and β respectively (he did not call them varieties), *E. purpureum* and *E. maculatum* L. Since, in so doing, he failed to "adopt the earliest legitimate epithet available for the group with its particular circumscription, position and rank," or one of them, his name is illegitimate under Arts. 56 and 59 (2) of the International Rules and must be rejected. Incidentally, there is no specimen labelled *E. verticillatum* in the herbarium of Lamarck. There are two, answering fairly well to the descriptions of α and β, and labelled respectively *E. purpureum* and *E. maculatum*. The latter the junior author was not able definitely to identify; the former is species 1, *E. verticillatum* as interpreted by the senior author.

The earliest name available for the species seems to be *E. dubium* Willd. ex Poir., a name substituted by Poiret for *E. punctatum* Willd. presumably because of the earlier *E. punctatum* Lam. The specimen in Walter's herbarium of his *E. fusco-rubrum*, a name cited by Wiegand as a possible synonym of species 1, turns out to be species 4, *E. purpureum* in the sense of the present treatment. Walter's description, like that of his *Acalypha caroliniana*,[3] is too confused to be

[1] Since in this case, the junior author's determination supported that originally made, no such precaution as in the case of *E. purpureum* seemed necessary, but photograph and notes were submitted to the senior author for rechecking.

Evidence corroborative of this determination, if any is needed, might be drawn from Kalm's itinerary. He reached America in September, 1748, too late to have collected any verticillate Eupatorium in young flower. In 1749 he was, during late July and August, in the St. Lawrence valley between Montreal and Quebec, a region in which only *E. maculatum*, as here understood, is known and in which it is a common and characteristic plant. (See Louis-Marie, Fl. Man. Québec, 250 and Victorin, Fl. Laurent. 583.) At the same season in 1750, his last summer in America, he was in western New York, where *E. maculatum* is the commonest, though not the only, species of its group.

[2] See RHODORA xxix. 6 (1927).

[3] See RHODORA, xxix. 197 (1927).

applied with any certainty; perhaps in both cases he mixed material, or field observations, of different species.

A restudy by the senior author has been made of the slender forms with three leaves in a whorl, possibly more common in the southern Alleghenies but by no means confined to that region, to see if they can be held specifically distinct from *E. purpureum* (species 4), but without success as to that. They all seem to belong to the same species-concept. Slender and small specimens from various parts of the range are often 3-leaved or even 2-leaved. However, the var. *amoenum* (Pursh) Gray should be recognized. It consists of more slender plants with chiefly lanceolate leaves which are glabrous or nearly so beneath (instead of elliptic-ovate, loosely hairy beneath). It occurs in the mountains from New Jersey, Pennsylvania and West Virginia to Georgia.

The nomenclature and synonymy of the species concerned is as follows.

1. EUPATORIUM DUBIUM Willd. ex Poir. Encyc. Suppl. ii. 606 (1811), a substitute name for *E. punctatum* Willd., probably because of *E. punctatum* Lam. TYPE (of *E. punctatum* Willd.) in Herb. Berlin. *E. purpureum* β L. Sp. Pl. 838 (1753), at least as to citations. *E. maculatum* L. Cent. Pl. i. 27 (1755) and Amoen. Acad. iv. 288 (1759), as to synonymy, and of many authors. *E. verticillatum* Lam. Encyc. ii. 405 (1786) (nomen illegitimum), at least as to plant α. *E. punctatum* Willd. Enum. Pl. Hort. Berol. 853 (1809), not Mill. (1768), nor Lam. (1786). *E. ternifolium* Ell. Sk. Bot. S. Car. & Ga. ii. 306 (1822?), probably. *E. purpureum* var. *maculatum* Darl. Fl. Cestrica 453 (1837), as to description. *E. maculatum* var. β *urticifolium* Barratt, Eup. Vert. no. 2 (1841)? *E. ternifolium* var. β *vesiculosum* Barratt op. cit. no. 3. *E. purpureum* sensu Mackenzie in Rhodora xxii. 158 (1920), not L.

2. E. MACULATUM L., l. c., as to description and TYPE in herb. Linnean Society of London. *E. Bruneri* A. Gray, Syn. Fl. N. Am. i. pt. 2, 96 (1884). *E. atromontanum* A. Nels. in Bot. Gaz. xxxi. 400 (1901). *E. Rydbergi* Britton, Man. 921 (1901). *E. purpureum* var. *Bruneri* (A. Gray) B. L. Robins. in Proc. Amer. Acad. xlii. 44 (1906). *E. trifoliatum* sensu Farwell in Rep. Mich. Acad. Sci. xx. 191 (1918), not L. *E. trifoliatum* var. *maculatum* (L.) Farwell, l. c., at least as to name-bringing synonym. *E. trifoliatum* var. *Bruneri* (A. Gray) Farwell, l. c., as to name-bringing synonym.

2a. Var. FOLIOSUM (Fern.) Wieg. in RHODORA xxii. 66 (1920). TYPE in Gray Herb. *E. purpureum* var. *foliosum* Fern. in RHODORA x. 86 (1908). *E. trifoliatum* var. *foliosum* (Fern.) Farwell, l. c. *E. Bruneri* var. *foliosum* (Fern.) House in Bull. New York State Mus. ccliv. 679 (1924).

3. E. FISTULOSUM Barratt, op. cit. no. 1 (1841) and in Wood, Classb. ed. 2, 314 (1847). TYPE in herb. Wesleyan University. *E. laevigatum* Torr. in Eat. Man. ed. 2, 245 (1818), not Lam. (1786). *E. purpureum* β *angustifolium* T. & G. Fl. N. Am. ii. 82 (1841) acc. to Barratt. *E. purpureum* and *E. trifoliatum* sensu Wieg. in RHODORA xxii. 67 (1920), not L. *E. maculatum* sensu Mackenzie in RHODORA xxii. 161 (1920), not L.

4. E. PURPUREUM L. Sp. Pl. 838 (1753), excl. syn. Cornut and Morison. TYPE in herb. Linnean Society. *E. trifoliatum* L. op. cit. 837. *E. fusco-rubrum* Walt. Fl. Car. 199 (1788), as to specimen in herb. Walter, though scarcely as to description. *E. falcatum* Michx. Fl. Bor.-Am. ii. 99 (1803). *E. verticillatum* Muhl. ex Willd. Sp. Pl. iii. 1760 (1804), probably, not Lam. (1786). *E. purpureum* var. β *album* Barratt, op. cit. no. 3 (an albino form). *E. purpureum falcatum* (Michx.) Britton in Mem. Torrey Bot. Club v. 312 (1894).

4a. Var. AMOENUM (Pursh) A. Gray, Syn. Fl. N. Am. i. pt. 2, 96 (1884). TYPE not known. *E. amoenum* Pursh, Fl. Am. Sept. ii. 514 (1814). *E. maculatum amoenum* (Pursh) Britton, l. c., at least as to name-bringing synonym. *E. trifoliatum* var. *amoenum* (Pursh) Farwell, l. c., as to name-bringing synonym. The following specimens, in the Gray Herbarium, may be cited as representative. WEST VIRGINIA: valley of East Fork of Greenbrier River, Pocahontas Co., 19 Sept., 1904, *Greenman*, no. 235; wood-road, Parsons, Tucker Co., Sept. 8, 1904, *Moore*, no. 1994. NORTH CAROLINA: Swain Co., alt. 1800 ft., Aug., 1891, *Beardslee & Kofoid*. GEORGIA: without definite locality, July, 1875, *C. Wright;* rich, shady woods, Whitfield Co., alt. 750 ft., July 18, 1900, *Harper* no. 70.

III. NOTES ON DIODIA

M. L. FERNALD AND LUDLOW GRISCOM

(Plate 469)

THE VARIETIES OF DIODIA TERES.—In eastern Virginia *Diodia teres* Walt. proved to be so variable in the field that a large series has been collected. Mr. C. A. Weatherby, upon looking for Walter's type, reports that there is no Walter material of it in his herbarium at the British Museum; but he found in Paris that the type of *Spermacoce diodina* Michx., commonly referred to it, is the common and well known weed with fruits 2.9–3.6 mm. long, covered with short appressed to spreading hairs (FIG. 1) and greatly exceeded by the stipules, and the leaves without prominently setiform tips. Since the latter plant is common all the way from Florida to New Jersey we are selecting it to stand as typical of Walter's species.

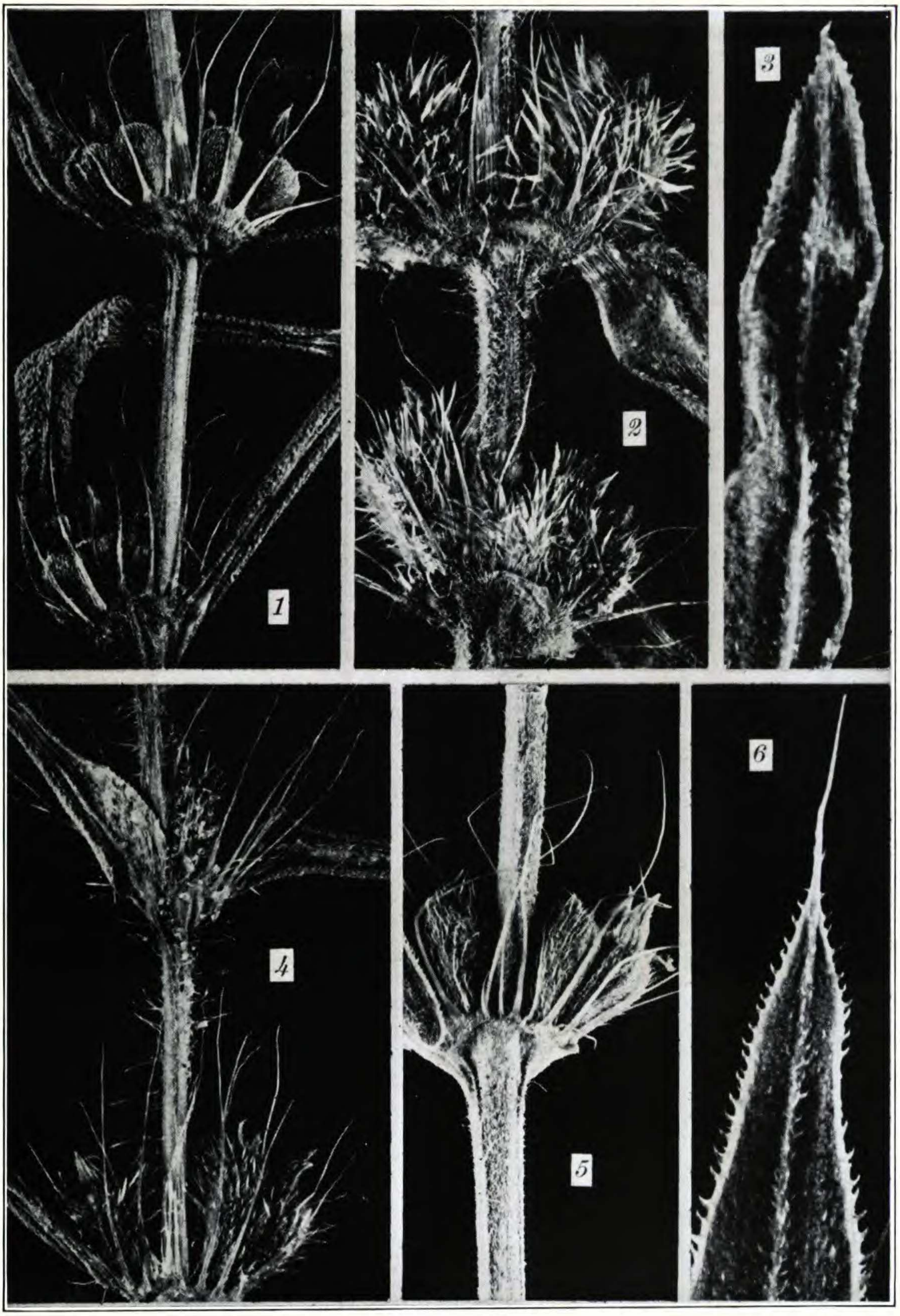


Photo E. C. Ogden.

VARIETIES OF DIODIA TERES, fruiting nodes × 5, leaf-tips × 10. FIG. 1, var. TYPICA; FIGS. 2 and 3, var. HYSTRICINA; FIG. 4, var. HIRSUTIOR; FIGS. 5 and 6, var. SETIFERA.

The most extreme departure from this type is a plant of the coastal sand of eastern Virginia, usually forming prostrate mats, with stipules shorter than to but slightly longer than the very large (3.8–5 mm. long) and divergently silvery-bristly fruits (FIGS. 2 and 3).

A third variety (FIG. 4) occurring from Florida to Mississippi and extending locally northward to North Carolina, has the long stipules of the typical form, but the fruits more spreading-hirsute and the stems conspicuously hirsute.

The commoner variation (FIGS. 5 and 6) from west of the Alleghenies, from southern Michigan to Texas, has the fruits and stipules as in typical *D. teres*, but the stems are strongly pubescent and the young leaves always terminate in a slender bristle. This plant may possibly have been described from the Mexican region, but until the very complex series from that area has been better clarified it is unsafe to identify it with any of the Mexican species. Consequently, the varietal name for it here proposed may, eventually, prove not to be the earliest name given it.

As we understand *Diodia teres* its variations may be summarized as follows.

DIODIA TERES Walt., var. **typica.** *D. teres* Walt. Fl. Carol. 87 (1788). *Spermacoce diodina* Michx. Fl. Bor.-Am. i. 82 (1803).—Very slender, erect or depressed; stem puberulent or minutely pilose; leaves without bristle-tips; stipules very much overtopping the fruits; fruits (excluding calyx-lobes) 2.9–3.6 mm. long, with short appressed to spreading stiff pubescence.—Florida to Texas, north to coast of Rhode Island, Connecticut and New York, northern New Jersey and Pennsylvania; less common west of the Alleghenies, north to Kentucky, Illinois and Missouri. FIG. 1.

Var. **hirsutior**, var. nov. (TAB. 469, FIG. 4), a var. *typica* differt caulibus fructibusque valde hirsutis.—TYPE; dry sandy soil, Duval Co., Florida, August, *A. H. Curtiss*, no. 1116 (in Gray Herb.). Extending from Florida to Mississippi and North Carolina.

Var. *hirsutior* forms a direct transition between var. *typica* and the following very extreme variety, which, if it were not for var. *hirsutior*, would appear to be a distinct species.

Var. **hystricina**, var. nov. (TAB. 469, FIG. 2 et 3), a var. *typica* differt caulibus plerumque depressis hirsutis; stipulis vix fructibus aequantibus; fructibus 3.8–5 mm. longis valde hispidis, pilis divergentibus.—Coastal sands of Northampton and Princess Anne Counties, Virginia. TYPE: sandy and argillaceous bluff and upper border of beach, Chesapeake Bay, west of Kiptopeke, Northampton Co., Virginia, October 14, 1935, *Fernald, Long & Fogg*, no. 5465.

Var. **setifera**, var. nov. (TAB. 469, FIG. 5 et 6), a var. *typica* differt

caulibus valde hirsutis; foliis immaturis apice setiferis.—Southern Michigan to Texas. TYPE: sandy plains, Peña, Texas, July 28, 1888, *Pringle*, no. 2242.

The figures are all × 5, except the leaf-tips (× 10).

THE VARIETIES OF DIODIA VIRGINIANA. In 1841 Torrey & Gray treated *Diodia virginiana* as a polymorphic species, with three primary varieties, but saying "We find so many intermediate forms between D. Virginica [i. e. *virginiana*], tetragona, and hirsuta of authors, that we can scarcely distinguish them even as varieties." And in the Synoptical Flora Gray omitted the varieties. Recently they have all been treated as species by Small, in his Manual. A study of the series in connection with our plants of southeastern Virginia shows that Torrey & Gray's treatment is the more satisfactory. The three varieties, as they conceived them and as we understand them are as follows; Small's key giving the essential characters.

DIODIA VIRGINIANA L., var. LINNAEI Torr. & Gr. Fl. ii. 29 (1841). *D. virginiana* L. Sp. Pl. 104 (1753). *D. virginica* Willd. Sp. i. 58 (1798), in part.—Florida to Texas, north to southern Illinois, Tennessee and New Jersey; casual northward.

Var. HIRSUTA (Pursh) Torr. & Gr. l. c. (1841). *D. hirsuta* Pursh, Fl. i. 106 (1814).—Florida and Alabama, north to North Carolina; also Cape May, New Jersey (August 16, 1871, *C. F. Parker;* and many later collectors).

Var. LATIFOLIA Torr. & Gr. l. c. (1841). *D. tetragona* of authors, perhaps Walt.—Florida to Louisiana, north to North Carolina.

Diodia Harperi Small, Man. 1264 (1933), described without citation of type, is a very distinct species if we correctly interpret it as represented by *Harper*, no. 1682, from Berrien Co., Georgia.

PLATE 469. DIODIA TERES Walter: FIG. 1, portion of fruiting branch, × 5, from Macon's Corner, Princess Anne County, Virginia, *Fernald & Long*, no. 5044.

Var. HYSTRICINA, n. var.: FIG. 2, portion of fruiting branch, × 5, from the TYPE, west of Kiptopeke, Virginia, *Fernald, Long & Fogg*, no. 5465; FIG. 3, tip of leaf, × 10, from the TYPE.

Var. HIRSUTIOR, n. var.: FIG. 4, portion of fruiting branch, × 5, from the TYPE, Duval County, Florida, *A. H. Curtiss*, no. 1116.

Var. SETIFERA, n. var.: FIG. 5, portion of fruiting stem, × 5, from the TYPE, Peña, Texas, *Pringle*, no. 2242; FIG. 6, tip of leaf, × 10, from the TYPE.

IV. NOMENCLATURAL TRANSFERS AND NEW VARIETIES AND FORMS

M. L. Fernald

(Plates 470–472)

Clematis virginiana L., forma **missouriensis** (Rydb.), comb. nov. *C. missouriensis* Rydb. in Britton, Man. 421 (1901). *C. virginiana*, var. *missouriensis* (Rydb.) Palmer & Steyermark in Ann. Mo. Bot. Gard. xxii. 542 (1935), the combination here ascribed to them only through leniency or courtesy, since they failed to give the essential citation of the name-bringing synonym.

In their *Annotated Catalogue of the Flowering Plants of Missouri*, Ann. Mo. Bot. Gard. xxii. no. 3 (1935) Palmer & Steyermark repeatedly made new combinations similar to their *Clematis virginiana*, var. *missouriensis*, in which THEY CITE ONLY THE NAME AND NEVER THE PLACE OF PUBLICATION OF THE DESCRIPTION upon which the combination is based. The validity of such transfers is open to serious doubt. The essential task of connecting the new combination with the fundamental diagnosis is left to all who wish to know what is meant. The International Rules seem to be clear on this point. Article 44 reads:

> The name of a species or of a subdivision of a species is not validly published unless it is accompanied (1) by a description of the group; or (2) by the citation of a previously and effectively published description of the group under another name; or (3) by a plate or figure with analyses showing essential characters; but this applies only to plates or figures published before January 1, 1908.
>
> Examples of validly published names of species.—*Onobrychis eubrychidea* Boiss. (Fl. Or. II, 546: 1872), published with a description.—*Hieracium Flahaultianum* Arv.-Touv. et Gaut., published on a label with a printed diagnosis in a set of dried plants (*Hieraciotheca gallica*, nos. 935–942: 1903).—*Cynanchum nivale* Nyman (Syll. Fl. Eur. 108: 1854–55), published with a reference to *Vincetoxicum nivale* Boiss. et Heldr. previously described.
>
> *Cynancum nivale* Nyman was published by the CITATION of the earlier and properly published *Vincetoxicum nivale* Boiss. & Heldr. WITH THE CORRECT BIBLIOGRAPHIC REFERENCE. Any one can look up the original reference and thus know what Nyman had in mind. Only the few who have the proper indices and who can take the necessary time to learn where and when Rydberg published *Clematis missouriensis* (which happened to be in the work of another author) can make out what Palmer & Steyermark mean. Technically it may (and probably should) be maintained that such new combinations are invalid. As stated, however, these combinations and others like them have often been taken up under mental protest and wholly through leni-

ency. In cases of early authors, before the rules of nomenclature had been much clarified, few would protest such leniency. In the very modern cases, with the rules clearly known and professed to be followed, the putting out of names which may by good luck barely "get by" or whose acceptance depends wholly on the good-nature and friendly consideration of other botanists, rather than upon accurate meeting of the full but simple requirements of valid publication, is not commendable. If in these days the author of a new combination cannot or will not cite the bibliographic source, he is not prepared to do accurate transferring.

Whether or not *Clematis virginiana*, var. *missouriensis* was a validly published combination, the taxonomic fact is, that it has little, if any, geographic segregation from *C. virginiana*. The key-differences given in Britton's Manual are, that *C. virginiana* has "Leaves glabrate or nearly so; achenes with a thick obtuse margin," *C. missouriensis* having "Leaves decidedly silky beneath; achenes marginless." Plenty of *C. virginiana* from Ontario, Quebec, Nova Scotia and New England has the leaves as densely and permanently "silky"-pilose beneath as in sheets specially marked by Rydberg as *C. missouriensis;* and mature fruit of the latter displays quite as prominent margins as the less pubescent plants. As a mere form with leaves densely and permanently pilose beneath it should have a designation; I cannot look upon it as a good variety.

AMERICAN PARNASSIA PALUSTRIS (PLATES 470 and 471). In 1926, misidentifying the characteristic plant of northern America, from Labrador and Newfoundland nearly across the continent, as *Parnassia palustris*, β. *multiseta* Ledeb. Fl. Ross. i. 263 (1842) and noting its many departures from typical *P. palustris* L. of Eurasia, I proposed an American and eastern Asiatic species, *P. multiseta* (Ledeb.) Fernald in RHODORA, xxviii. 211 (1926). Subsequently Dr. Eric Hultén[1] has shown that true *P. palustris*, β. *multiseta* of Ledebour, the Asiatic plant, is not different from typical *P. palustris*. At the same time Hultén was inclined to place the American plant near *P. palustris*, var. *tenuis* Wahlenberg, Fl. Lapp. 74 (1812).

Granted that the type of *Parnassia palustris*, β. *multiseta*, therefore the type of *P. multiseta*, is inseparable from typical *P. palustris* (PLATE 470) it becomes necessary to find a proper name for the wide-ranging American plant (PLATE 471, FIGS. 1–8), for it is not satisfactory to refer it to var. *tenuis* (PLATE 471, FIGS. 9–11). I have, therefore, restudied the series and agree with Hultén that the broadly dispersed American plant is best treated as a geographic variety of *P.*

[1] Hultén, Fl. Kamtch. iii. 36 (1929).

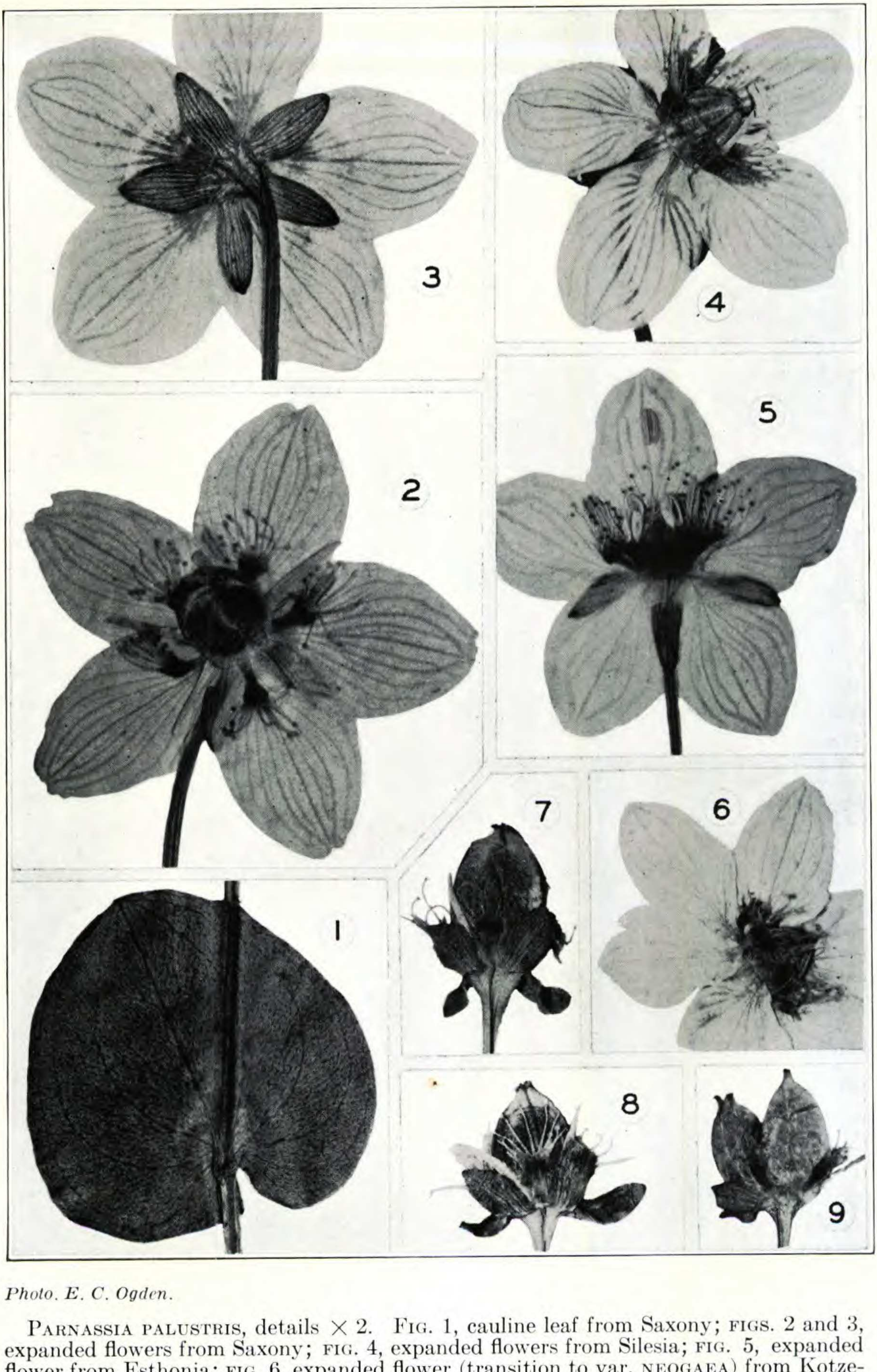


Photo. E. C. Ogden.

PARNASSIA PALUSTRIS, details × 2. FIG. 1, cauline leaf from Saxony; FIGS. 2 and 3, expanded flowers from Saxony; FIG. 4, expanded flowers from Silesia; FIG. 5, expanded flower from Esthonia; FIG. 6, expanded flower (transition to var. NEOGAEA) from Kotzebue Sound; FIG. 7, fruit from Bohemia; FIG. 8, fruit from Moravia; FIG. 9, fruit from Upper Austria.

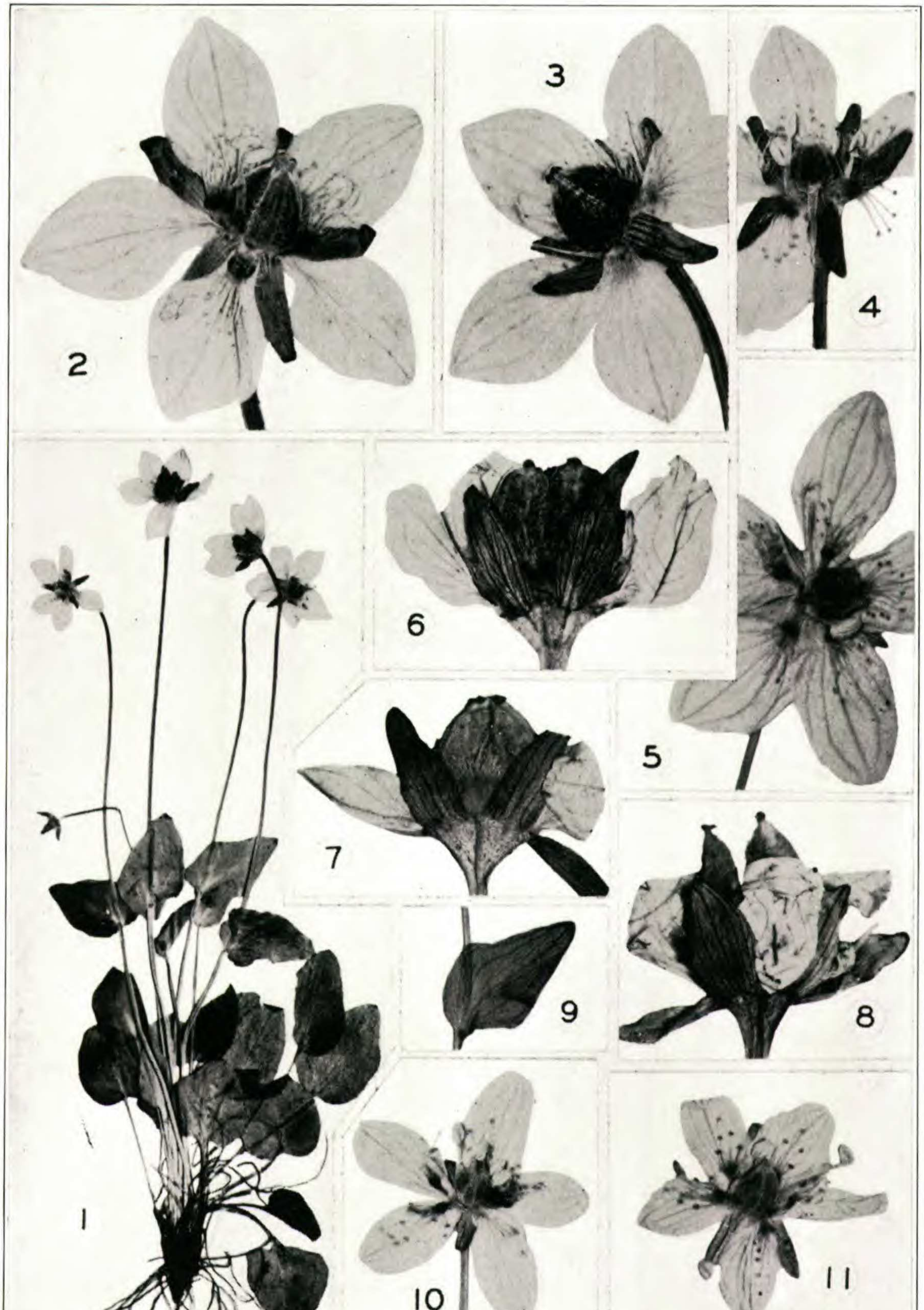


Photo. E. C. Ogden.

PARNASSIA PALUSTRIS, vars., habit × ½, details × 2.

Var. NEOGAEA: FIG. 1, TYPE from Newfoundland; FIGS. 2–4, expanded flowers from Newfoundland; FIG. 5, expanded flower from Alaska; FIG. 6, fruit from Newfoundland; FIG. 7, fruit from Minnesota; FIG. 8, fruit from Manitoba.

Var. TENUIS: FIG. 9, cauline leaf from Jenissei; FIG. 10, expanded flower from Switzerland; FIG. 11, expanded flower from Iceland.

palustris—so strong a variety that to many it would stand unquestioned as a species. The distinctions are brought out in PLATES 470 and 471 (all details × 2) as well as can be done in view of the very slight color-contrasts in the flowers. These may be summarized as follows:

P. PALUSTRIS (typical). Cauline leaf rounded-ovate; calyx-lobes firm, oblong or elliptic, barely half as long as mature capsule, loosely ascending to reflexed in maturity; petals emarginate and apically with coarse teeth or merely round-tipped or obtuse, with about 13 conspicuous nerves and nerve-branches, soon deciduous; staminodia tapering below to narrow claws. Eurasia and Behring Sea region of Alaska. PLATE 470.

P. PALUSTRIS, var. (American). Cauline leaf deltoid-ovate, subacuminate; calyx-lobes subherbaceous, linear-lanceolate to lance-oblong, two-thirds as long to longer than capsule, less divergent or reflexed in maturity; petals rhombic-elliptic, tapering about equally to base and apex, with 7–11 faint nerves and nerve-branches, marcescent; staminodia with shorter and broader claws. Labrador to interior Alaska and locally southward. PLATE 471, FIGS. 1–8.

In the Behring Sea region of Alaska some plants are quite typical *Parnassia palustris*, others (PLATE 470, FIG. 6) show evident transition to the continental American plant. On account of the very evident transition in western Alaska between the two extremes I am treating the continental plant of North America as a geographic variety rather than as a species. It is not satisfactory to place it with var. *tenuis*. The latter plant superficially resembles ours in its cauline leaf (PLATE 471, FIG. 9) but it has much smaller flowers (FIGS. 10 and 11), with narrower petals subemarginate to broadly rounded at tip as in *typical P. palustris*, with the narrow-clawed staminodia of the latter plant, and, in anthesis, with the ovary very small. I have not seen good fruit of it. However, our generally dispersed variety of *P. palustris* is so well defined that I am calling it

PARNASSIA PALUSTRIS L., var. **neogaea**, var. nov. (TAB. 471, FIG. 1–8), foliis caulinis deltoideo-ovatis subacuminatis; calycis lobis subherbaceis lineari-lanceolatis vel late lanceolatis vel lanceolato-oblongis capsulam 2/3 aequantibus vel subaequantibus adscendentibus vel laxe patentibus; petalis rhomboideo-ellipticis ad basim et ad apicem aequaliter angustatis pallide 7–11-nervis marcescentibus; staminodiis cuneatis vel late unguiculatis.—Wet calcareous or basic soils, Labrador to Alaska, south to northwestern Newfoundland, northern Michigan, northern Minnesota, North Dakota, Wyoming and Oregon. TYPE: brookside on slaty hills back of Little Quirpon, Newfoundland, August 8, 1925, *Fernald & Gilbert* no. 28,481 (in Gray Herb.).

The many specimens cited by me as *Parnassia multiseta* in RHODORA xxviii. 211, 212 (1926), with the exception of those from the Behring

Sea region of Alaska and from Kamtchatka and that from California belong to *P. palustris*, var. *neogaea*.

PLATE 470, all details × 2. PARNASSIA PALUSTRIS L.: FIG. 1, cauline leaf, from Waldenburg, Saxony, August 17, 1879, *Rehder;* FIGS. 2 and 3, expanded flowers, from same collection as fig. 1; FIG. 4, expanded flower, from Silesia, August 2, 1888, *Gebhardt;* FIG. 5, expanded flower, from Esthonia, *Sirgo* in Eston. Pl. no. 63; FIG. 6, expanded flower, transitional to var. *neogaea*, from Kotzebue Sound, Alaska, *Charis;* FIG. 7, fruiting calyx and capsule, from Dörfel, Bohemia, Petrak, Fl. Bohem. et Morav. Esxicc., Lfg. 1, no. 69; FIG. 8, fruiting calyx and capsule, from Ochoz, Moravia, *Jirasek & Svestka*, no. 329; FIG. 9, fruiting calyx and opened capsule, from Mt. Lichtenberg, Upper Austria, *Rauscher* in Fl. Exsicc. Austr.-Hung., no. 2511.

PLATE 471, details × 2. PARNASSIA PALUSTRIS L., VAR. NEOGAEA, n. var.: FIG. 1, TYPE, × ½, from Little Quirpon, Newfoundland, *Fernald & Gilbert*, no. 28,481; FIG. 2, expanded flower, from Flower Cove, Newfoundland, *Fernald, Long & Dunbar*, no. 26,749; FIG. 3, expanded flower, from the TYPE; FIG. 4, expanded flower, from Isthmus Cove, Pistolet Bay, Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 28,480; FIG. 5, from Anvik, Alaska, *J. W. Chapman*, no. 22; FIG. 6, fruiting calyx and opened capsule, from St. Barbe, Newfoundland, *Fernald, Long & Dunbar*, no. 26,751; FIG. 7, fruiting calyx and capsule, from Turtle Lake, Minnesota, August, 1892, *Sheldon;* FIG. 8, fruiting calyx and opened capsule, from Churchill, Manitoba, *G. Gardner*, no. 4ᵉ1.

Var. TENUIS Wahlenb.: FIG. 9, cauline leaf, from Dudinskoje (lat. 69° 23′), Jenissei, *Tolmatchew*, no. 137; FIG. 10, expanded flower, from Switzerland, *Nigg* in Braun-Blanquet, Fl. Raet. Exsicc., no. 257; FIG. 11, expanded flower, from Skutustadir-Myvatu, Iceland, July 14, 1895, *Elizabeth Taylor*.

BAPTISIA AUSTRALIS (L.) R. Br., var. **minor** (Lehm.), comb. nov. *B. minor* Lehm. in Nov. Act. Nat. Cur. xiv. 803 (1829). *B. australis* β. Torr. & Gray, Fl. N. Am. i. 385 (1840).—Differing from typical *B. australis* in its shorter-petioled and firmer leaves, with the larger mature leaflets only 1.5–4 cm. long.—The representative of the woodland, eastern *B. australis* on rocky prairies, in ravines and in open woods from Missouri and Kansas to Texas.

B. australis, var. *minor* seems to me a good geographic variety of *B. australis*, comparable with varieties of many other species in the more open and arid region west of the Mississippi, in having firmer and smaller foliage. I get no good differences of flower or fruit to separate it from the Alleghenian *B. australis*. It is probable that this plant was partly in mind when *B. vespertina* was published. The latter appeared as *B. vespertina* Small in Rydberg, Fl. Prair. Pl. 456 (1932), with a range given like that of *B. australis*, var. *minor*, the only member of the genus there treated by Rydberg with *blue* flowers, but described as having "stipe of the pod longer than the body." No form of the blue-flowered *B. australis* has such a stipe and I have never seen one in the genus; ordinarily it is barely exserted from the calyx and one-eighth to one-tenth as long as the body. No type is cited and it is surmised that *B. vespertina* was clumsily and erroneously

described; the blue-flowered *Baptisia* of Rydberg's area has very short and upwardly dilated stipes.

As to the typification of var. *minor*, one of Lehmann's specimens of his *B. minor* is in the Gray Herbarium. It is the small-leaved southwestern extreme.

ASTRAGALUS FRIGIDUS (L.) Gray, var. **gaspensis** (Rousseau), comb. nov. *A. gaspensis* Rousseau, Contr. Lab. Bot. Univ. Montréal, no. 24: 51 (1933). PLATE 472, FIGS. 9–13.

I am quite unable to find in var. *gaspensis* constant differences from Eurasian *Astragalus frigidus* and its western North American var. *americanus* (Hook.) Watson. Only on the slightly smaller legumes can the Gaspé plant be separated from the latter, which by such conservative and universally respected students as Sir William Hooker, Torrey, Bunge, Gray and Watson was considered only an American variety of the circumboreal *A. frigidus*. This species, treated by Ledebour (Fl. Ross.) as a series of slightly differing varieties across Europe and Siberia, has at least three varieties in North America. By Marcus E. Jones the Rocky Mountain plant was taken up as a species, *A. americanus* (Hook.) Jones, but he did not separate off the Gaspé plant; neither did Rydberg (N. Am. Fl.)! But Rousseau, in his student-thesis on *Les Astragalus du Québec*, treats the Gaspé material as constituting a definite species with several reputed constant characters.

It is most difficult to understand how Rousseau got his idea of typical *Astragalus frigidus* of Europe. His comparative note is as follows:

> L'*A. gaspensis* diffère de l'*A. frigidus* de l'Europe (fig. 13) par le calice glabre, les dents calicinales non tachetées de noir, la pubescence plus légère des dents et des sinus, le pistil et le fruit glabres, le calice relativement moins long. L'*A. gaspensis* possède en outre un fruit généralement plus court et plus obtus aux deux bouts.[1]

Rousseau (p. 45) describes *Astragalus frigidus* of Europe as having "Calice: tube (long. 7 mm., circonf. 6–7.5 mm.) recouvert d'une pubescence noire; dents (long. env. 1 mm.) noires, aigues . . . . Legumes fusiformes aigus . . . recouverts d'une pubescence noire et dense." Such a description and comparative note, with emphasis upon black pubescence of the calyx-tube, black teeth and *dense* black pubescence of the "fusiform" "acute" legume, strongly contrasts with the diagnosis of *A. gaspensis:* "Calicis tubo . . . glabro; dentibus viridibus

[1] Rousseau, l. c. 54 (1933).

. . . . leguminibus ovoidibus, obtusis ad apices, . . . glabris"; and Rousseau publishes drawings (his fig. 13, here reproduced, in part, as FIGS. 6 and 11) to bring out his points.

As stated, it is not clear how Rousseau acquired his conception of true *A. frigidus.* Linnaeus in 1755, in the 2d edition of his Flora Suecica, gave a detailed account of the plant, *Phaca alpina,* which under *Astragalus,* is *A. frigidus.* His "Calyx *campanulatus, glaber, dentibus fuscis*"[1] was unequivocal. So was his account, in 1763, of the "Legumen . . . *cylindrico-ovatum, adspersum pilis raris.*"[2] A. P. Decandolle, describing *Phaca frigida* in 1802, said "Calyx . . . *pallidus, glaber.*"[3] Gradually, as material has accumulated, it has been realized that the calyx-tube may be either quite glabrous or sparsely pubescent. We accordingly find Rouy saying "Calice . . . presque glabre à la base, couvert de poils noirs au sommet";[4] and Ascherson & Graebner, "Kelch . . . am Grunde fast kahl, oberwärts schwarz behaart."[5] Of the inflorescences of European *A. frigidus* in the Gray Herbarium most show, upon careful search, a few scattered dark strigae on the calyx-tube (FIGS. 2, 3, and 5) but 10 specimens (FIG. 4) show none whatever. Sufficient search in the American material, which usually has glabrous calyx-tubes, will reveal similar trichomes. FIG. 14 is of a calyx from *Stewardson Brown,* no. 1250, from Maligne Lake, Alberta, of *A. frigidus,* var. *americanus,* which, because of its "glabrous" calyx Rousseau maintains as a species, *A. americanus,* separate from *A. frigidus.* As an absolute specific character the glabrousness is rather fickle.

The tendency to black trichomes on the borders of the calyx-teeth in the European *Astragalus frigidus* seems to be general, though very variable, some specimens barely showing it. In var. *gaspensis* (FIG. 10) the minute pubescence of the teeth is whitish. In var. *gaspensis,* too, as in var. *americanus,* the legume is glabrous, in typical *A. frigidus* and in var. *littoralis* (Hook.) Wats. it is pubescent; but in the European plant the pubescence is so short (FIG. 8) that, in first publishing *Phaca frigida,* Linnaeus said "legum . . . subpilosis";[6] and later authors specially note its shortness; "kurz rauhhaarig" (*Aschers. & Graebn.*), "courtement pubescents" (*Rouy*). In lacking this very short strigose pubescence the legumes of var. *gaspensis* can readily be

[1] L. Fl. Suec. ed. 2: 256 (no. 657) (1755).
[2] L. Sp. Pl. ed. 2: 1064 (1763).
[3] DC. Astrag. 58 (1802).
[4] Rouy, Fl. de Fr. v. 169 (1899).
[5] Aschers. & Graebn. Synop. vi². 763 (1909).
[6] L. Syst. Nat. ed. 10, ii. 1173 (1758–59).